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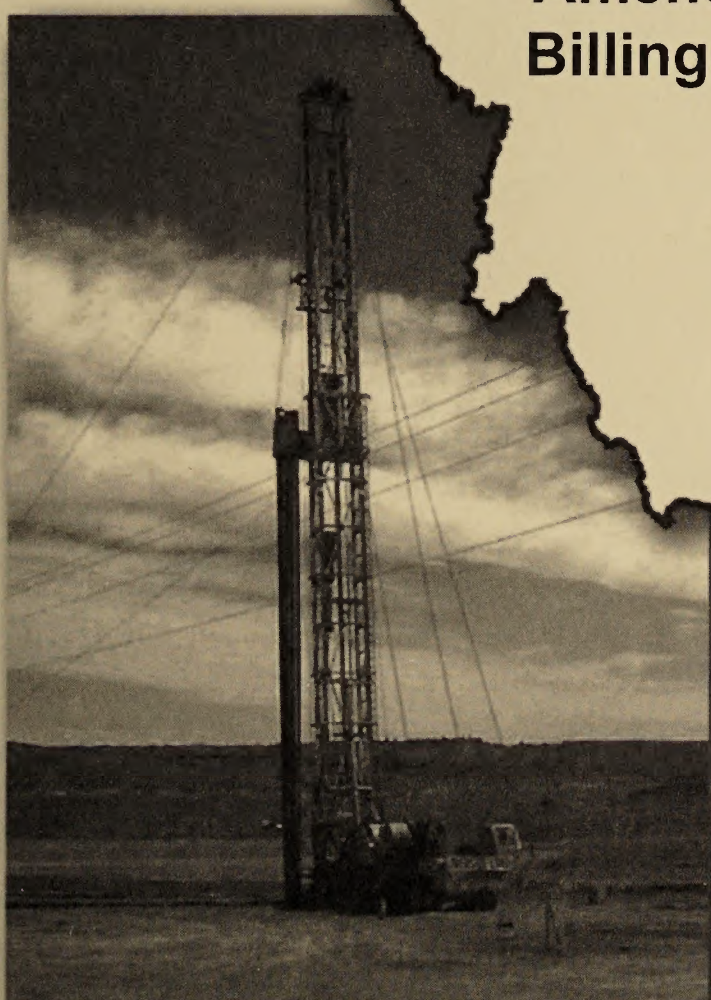
Final Supplement to the Montana Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment of the Powder River and Billings Resource Management Plans



VOLUME II

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U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based on the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation; rangelands; timber; minerals; watershed; fish and wildlife; wilderness; air; and scenic, scientific, and cultural values.

BLM/MT/PL-08/016

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CONSULTATION & COORDINATION

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CHAPTER 5: CONSULTATION AND COORDINATION

Introduction

In 2003, the Bureau of Land Management (BLM) and the State of Montana jointly prepared the Montana Statewide Oil and Gas Final Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans (Statewide Document). The Statewide Document analyzed the environmental impacts associated with amending the resource management plans (RMPs) to change existing land use decisions regarding the development of oil and gas resources, including coal bed natural gas (CBNG) exploration and development. The Record of Decision (ROD) for the Statewide Document was approved on April 30, 2003.

As a result of lawsuits filed against the BLM's decision, the District Court ordered the BLM to prepare a supplement to the Statewide Document. The U.S. District Court for the District of Montana identified three topics to be evaluated in the supplement:

1. CBNG phased development
2. Cumulative impacts from the proposed Tongue River Railroad
3. How private water well mitigation agreements will help alleviate the impacts of methane migration and groundwater drawdown

The Draft Supplement to the Montana Statewide Oil and Gas EIS and Amendment of the Powder River and Billings RMPs (DSEIS) was prepared by an interdisciplinary team of specialists from the BLM's Miles City Field Office and Billings Field Office, the Montana State Office of the BLM, and the consulting firms of ALL Consulting and Parametrix under contract to the BLM.

Preparation of the document began in August 2005. The BLM solicited comments from agencies and the public using a variety of tools to announce the beginning of the SEIS process. Public participation activities included public scoping meetings, informal meetings, SEIS website information, and newsletters. Biweekly teleconference calls are also hosted by the BLM to provide ongoing communication with cooperating agencies and collaborators.

Public Participation

The BLM prepared a public participation plan to guide project management and team efforts to develop the SEIS and to ensure public involvement during the entire SEIS preparation process. During the scoping for and preparation of the DSEIS, formal and informal public input was encouraged.

The 30-day scoping period began with the *Federal Register* Notice of Intent (NOI) published on August 5, 2005 (Vol. 70, No. 150, Page 45417). The scoping period and the availability of planning criteria were announced in a legal notice, newspaper advertisements, and media releases. During the scoping period, the BLM received written comments in the form of letters, comment forms, and emails.

Public scoping meetings were held in four towns within the Planning Area. Total attendance was 126 people, with some people attending more than one meeting.

PLACE	DATE ATTENDANCE	
Broadus	August 22, 2005	24
Lame Deer	August 23, 2005	65
Billings	August 24, 2005	22
Miles City	August 25, 2005	15
Total		**126**

A meeting was also held with the Northern Cheyenne Tribe during the public scoping period.

More than 500 comments were submitted during the scoping meetings and in written communications. Many comments were received in several categories, including air quality, oil and gas, phased development, water resources, and wildlife.

What has Changed in Chapter 5 Since the DSEIS?

Chapter 5 documents the public participation-as well as agency and tribal consultation and coordination-during the preparation of this SEIS. A detailed list of Tribal coordination dates and meetings is provided. The most significant addition is the list of the public's comments, along with the agency responses. Comments and responses are provided for each resource topic.

Following the public scoping period, the BLM held an alternative development meeting with cooperating agencies and other collaborators on September 21, 2005, in Miles City. As a result of this meeting, a preliminary phased development alternative was developed and distributed to the cooperating agencies and collaborators for comment. Based on cooperating agency and other collaborator comments, and further consideration of scoping comments, the BLM revised the alternative.

The revised phased development alternative was then summarized in an October 2005 project newsletter. More than 1,800 copies of the newsletter were sent to interested parties on the current project mailing list. The phased development alternative presented in the newsletter was based on the proposed high range of development identified in the original reasonably foreseeable development (RFD) report. In response to several comments received as a result of the newsletter, the BLM developed a second phased development alternative based on the low range of predicted development.

On November 9, 2005, another meeting was held in Miles City with cooperating agencies and other collaborators. Both the high and low range phased development alternatives were presented for discussion and feedback. As a result of this meeting, the two alternatives were fine-tuned before impact analysis.

On February 2, 2007, a Notice of Availability (NO A) was published in the *Federal Register* announcing the availability of the DSEIS and beginning a 90 day public comment period which ended on May 2, 2007. Approximately 1510 copies of the DSEIS were distributed to the public for comment. Additionally, a copy was posted on the BLM-Miles City Field Office SEIS website for downloading by the public.

Public meetings were held at five locations within the Planning Area to gather comments on and answer questions concerning the DSEIS.

PLACE	DATE	ATTENDANCE
Broadus	March 26, 2007	29
Billings	March 27, 2007	50
Hardin	April 17, 2007	9
Lame Deer	April 17, 2007	43
Miles City	April 19, 2007	30
TOTAL		**161**

The meetings were attended by a total of 161 members of the public. Comments were received both in writing and orally.

On December 12, 2007 a Notice of Availability (NOA) was published in the *Federal Register* announcing the availability of a Supplemental Air Quality Analysis for the DSEIS and beginning a 90 day public comment period which ended on March 13, 2008. A public meeting was held at Miles City, Montana on February 20, 2008. The meeting was attended by 12 members of the public. Comments were received both in writing and orally.

Consultation with U.S. Fish and Wildlife Service on Threatened and Endangered Species

As required by section 7 of the Endangered Species Act (ESA) of 1973, the BLM initiated consultation with U.S. Fish and Wildlife Service (FWS) by submitting a letter dated September, 15, 2005, to FWS. This letter introduced the project and requested a list of threatened and endangered species to be considered in the DSEIS. The FWS responded with a letter, dated November 4, 2005, to provide an updated species list for preparation of a biological assessment (BA). A copy of this letter is included in the Wildlife Appendix of the SEIS.

The BLM then prepared a BA based on the preferred alternative and submitted the document to FWS. A copy of the draft BA is included in the Wildlife Appendix of this SEIS.

The following is a record of correspondence between the BLM and FWS for section 7 consultation.

09/15/05	The BLM submitted a letter introducing the project and requesting an updated species list
11/04/05	FWS responded to the BLM letter dated September 15, 2005, request for updated species list
09/13/06	The BLM submitted the Draft BA for FWS review
04/27/07	FWS provides comments to BLM.

Consultation with FWS has continued throughout the SEIS process. As BLM did not propose actions that may affect a threatened or endangered species, formal consultation as required by section 7 of the ESA would not be required (P.C. FWS 1/17/08).

Consultation and Coordination with Native American Tribes

This section summarizes the BLM's consultation and coordination efforts with the tribes in preparing the SEIS. The list does not include routine phone calls, such as the biweekly teleconference calls held with cooperating agencies and other collaborators during preparation of the SEIS.

Crow Tribe

09/21/05 Meeting on Phased Development Alternative held at Ft. Keogh in Miles City, MT, attended by representatives of the Crow Tribe

06/27/06 Consultation meeting on the DSEIS held at the Crow Agency, attended by representatives of the Crow Tribe

03/26/08 Consultation meeting on the Supplemental Air Quality Analysis was held on the Crow Reservation in Crow Agency, Montana. This meeting was attended by representatives of the Crow Tribal Council.

Northern Cheyenne Tribe

09/07/05 SEIS consultation meeting with the Northern Cheyenne Tribe held in Lame Deer, MT

09/21/05 Meeting on phased development alternative held at Ft. Keogh in Miles City, MT, attended by representatives of the Northern Cheyenne Tribe

11/29/05 Meeting to present and collect feedback on two phased development alternatives held in Lame Deer, MT

04/13/06 Meeting with the Northern Cheyenne Tribe to discuss the phased development alternatives

11/9/06 Meeting with the Northern Cheyenne Tribe to discuss a new phased development alternative

4/5/07 Consultation meeting on the DSEIS held at Lame Deer, MT, attended by representatives of the Northern Cheyenne Tribe

03/13/08 Consultation meeting on the Supplemental Air Quality Analysis held in Lame Deer, MT, attended by representatives of the Northern Cheyenne Tribe

Lower Brule Sioux

06/08/05 Meeting to present SEIS project and discuss MOU with tribe for cooperating agency status held at the Lower Brule Sioux headquarters in Lower Brule, SD

11/09/05 Meeting to discuss phased development alternatives and elements of a preferred alternative held at Ft. Keogh in Miles City, MT, attended by representatives of Lower Brule Sioux Tribe

04/09/08 Consultation meeting on the Supplemental Air Quality Analysis was held at the Lower Brule Sioux Reservation, in Lower Brule, South Dakota. This meeting was attended by representatives of the Lower Brule Sioux Tribal Council.

The Lower Brule Sioux Tribe of South Dakota and the Crow Tribe of Montana have agreed to participate as cooperating agencies for this project. The Northern Cheyenne Tribe has entered into formal Government-to-Government consultation in preparation of this document.

Consistency

The BLM's planning regulations require that resource management plans "be consistent with officially approved or adopted resource related plans, and the policies and programs contained therein, of other Federal agencies, State and local governments, and Indian tribes, so long as the guidance and resource management plans are also consistent with the purposes, policies, and programs of Federal laws, and regulations applicable to public lands...." (43 CFR 1610.3-2).

All federal, state, and local agencies and Tribal councils have been requested to review this document and inform the BLM of any inconsistencies with their plans.

The Montana Governor's clearinghouse will be supplied with copies of the final document for review to ensure consistency with the state's plans.

Comments and Responses

The BLM received 152 public response documents, including letters, e-mails, website submittals, comment forms, and public meeting testimony during the DSEIS and the BLM 2007 Supplemental Air Quality Analysis (SAQA) public comment periods. In preparing the FSEIS, the comments were used to accomplish the following:

- Modify analysis
- Develop and evaluate analyses not previously considered by the agency
- Supplement, improve, or modify the analysis
- Make factual corrections
- Explain why the comments do not warrant further agency response

Comments that expressed a preference or opinion did not affect the analysis. These comments were carefully considered in the decision-making process for developing the FSEIS. Copies of all comments are available at the BLM Miles City Field Office.

Comments that were incorporated into this analysis for the FSEIS are included in this chapter, grouped by topic area. Comments that addressed multiple topics were placed under the predominant concern or issue. Any comment that contains a reference to a specific chapter, page, table, map, or figure refers to the DSEIS document. Each comment is then followed by BLM's response. References to pages, tables, maps or figures refer to the FSEIS.

Air Quality and Climate

Comment 1 (C-1): Are there any studies, information, or guesses as to how much CBNG is released naturally into the atmosphere, contributing to the greenhouse gasses? How much naturally occurring CBNG escaping to the atmosphere would be reduced by lessening the pressure and putting these gasses to beneficial use?

Response 1 (R-1): For a discussion of methane seepage to the surface, see the Geology and Minerals section of Chapter 3 under the heading "Methane Seepage, Migration, and Venting."

C-2: The FSEIS must identify the maximum permissible air emissions as part of its evaluation of the role that phased development can play as a mitigation strategy in achieving compliance with applicable air quality requirements. To perform an evaluation of the mitigation benefits that can be achieved by phased development, the FSEIS must identify the level of emissions that can be allowed from the project, when considered together with other emissions in the region, without causing or contributing to violations of the various Clean Air Act (CAA) requirements.

R-2: An air quality model that considered the project impacts to air quality from Alternative E and phased development alternatives F and H was conducted for the SEIS. The air quality model considered the potential for air quality impacts from all sources, including project sources, and evaluated the predicted air emissions with respect to applicable air quality standards. The maximum air concentrations were predicted to be below applicable state and national ambient air quality standards. The results of the analyses are included in Chapter 4 under "Air Quality and Climate", in the Air Quality Appendix, and in the Air Quality Technical Support Document (BLM 2006). In addition, the Montana Department of Environmental Quality (MDEQ) has permitting authority for all individual sources that could impact air quality and has also committed to conducting an annual air model to assess overall impacts resulting from project-related activities. As part of the air quality impact analysis, BLM has modeled the level of development that eliminates visibility impacts over the life of the project at Class I airsheds including the Northern Cheyenne Reservation. This effort is based on actual well-to-compressor ratios that are currently being experienced in the Montana portion of the Powder River Basin (PRB). The results of these air quality mitigation modeling efforts are included in the Air Quality and Climate section of Chapter 4, the Air Quality Appendix, and the Supplemental Air Quality Analysis Document (BLM 2007).

C-3: The FSEIS identifies that CBNG companies will be exploring, constructing, and operating with few, if any, mitigation measures until ambient air quality monitoring and/or annual cumulative ambient air quality modeling indicate that an ambient air quality standard or increment has been exceeded. After an exceedance of an ambient air quality standard or increment is realized, the FSEIS then identifies authorities and obligations of MDEQ, tribal authorities, and/or the Environmental Protection Agency (EPA) to require controls to restore air quality back to within the ambient standards and/or increment. Implementing mitigation measures after an ambient air quality standard or increment is exceeded is not the appropriate approach. Rather, the

FSEIS should identify, and BLM should require, the mitigation measures as emission control requirements in each alternative to minimize air quality impacts from oil and gas development. Placing emission controls on all sources, non-permitted and permitted alike, will help preserve the air quality of the area, while allowing the appropriate CBNG development to occur. In addition, the FSEIS should include as required mitigation measures that all CBNG compressor engines be either lean-burn engines or rich-burn engines with properly installed and maintained non-selective catalytic reduction (NSCR) units. The FSEIS should include as mitigation measures the emission control requirements for engines located at facilities that do not exceed the 25 tons per year permitting threshold.

R-3: All CBNG operations equipment, such as compressor engines, currently operating within the Project Area have permitted air emissions controls installed on them based on MDEQ permitting and Best Available Control Technology (BACT) determinations. Such measures include but are not limited to catalytic oxidation units, air-to-fuel ration controllers, and non-selective catalytic reduction. In addition the following measures are part of the preferred alternative:

- Use of surface material for roads, well pads, and facility sites on soils susceptible to wind erosion
- Dust inhibitors on unpaved collector, local and resource roads
- Posting and enforcing speed limits
- Maximize the number of wells per compressor
- Require natural gas fired or electrical compressors or generators

Project-related air emissions sources that would not have air emissions controls consist of construction or development equipment such as bulldozers and drilling rigs. The authority for requiring air emissions controls on these types of mobile sources, or on stationary sources such as compressor engines with air emissions that do not exceed the current 25 tons per year threshold, lies with MDEQ. BLM would support MDEQ should it choose to implement regulations that would require these mobile sources, or other sources that currently do not require permits or controls, to have permitted air emission controls. BLM does have the authority to implement mitigation measures through the alternative selection process, the use of conditions of approval for Applications for Permit to Drill (APDs), or the use of lease stipulations. BLM has worked with MDEQ to include conducting an annual air quality model to assess the impacts resulting from CBNG development as an element of phased development under Alternatives F, G, and H. In addition, MDEQ has moved to a policy of conducting AERMOD models for all compressor stations that would require a permit. These models will look at both near-field (fenceline) emissions as well as cumulative emissions. The results of modeling at the permit stage and on a continuing cycle will identify when additional mitigation measures may be necessary before air quality standards are compromised. Examples of measures that could be implemented to mitigate air impacts are included in the Air Quality and Climate section of Chapter 4 under "Mitigation" and in Attachment B to the Air Quality Appendix. BLM would work with MDEQ and EPA in determining what mitigation measures would be most effective in addressing impacts to air quality and how or when those measures should be implemented.

C-4: The SEIS identifies mitigation measures that are common to all alternatives in Table 2-1 (page 2-8). However, the common mitigation measures are not required mitigation measures in the preferred alternative. These mitigation measures should be required in the preferred alternative.

R-4: Mitigation measures that are common to all alternatives would be required for all alternatives, including the Preferred Alternative (H).

C-5: BLM should fund the installation and operation of appropriately located ambient air quality monitors for NOx or particulate matter in the PRB.

R-5: The PRB Interagency Air Quality Task Group made recommendations and established the Montana portion of the PRB as a high priority area for monitoring. On May 10, 2007, the Powder River Basin Interagency Working Group decided that the Montana BLM and MDEQ would approach the Montana CBNG operators to determine if there were opportunities for funding assistance. The BLM and MDEQ will continue to pursue options for installing and operating additional air quality monitoring stations in the Montana portion of the Powder River Basin monitoring pollutants including nitrogen oxides, $PM_{2.5}$, PM_{10} and ozone.

C-6: The SEIS correctly states that MDEQ has committed to preparation of an annual estimate of cumulative impacts of CBNG development as resources allow, but many of the sources locating in the impact area are not installing equipment that exceed MDEQ's 25 tons per year permitting threshold. MDEQ has no way to track these sources under current law. BLM could require its permittees

to submit an annual report summarizing emissions data and the required modeling parameters to allow MDEQ, or BLM if necessary, to conduct this annual modeling study.

R-6: BLM does have estimates for emissions that would be associated with construction equipment or other non-permitted project emissions that could be used for the emissions input to the annual air quality modeling conducted by MDEQ. These estimates are derived from industry standards and EPA publications and are widely used for air quality modeling. It is correct that a compressor site with two compressor engines does not typically exceed the tons per year threshold for implementing MDEQ's permitting process. However, the engines used for these compressors are very similar, if not identical, to those currently being permitted by MDEQ, thus, providing another means to develop reasonable estimates for annual air quality modeling. BLM and MDEQ will both have to track development activities to account properly for emission sources to keep the annual monitoring up to date. If it becomes necessary to use other measures to ensure that this information is tracked, the Monitoring Appendix already includes the provision that BLM could require submittal of annual emission reports.

C-7: With respect to the breadth and scope of the increment and visibility impacts in the SEIS, consider the following. If all of the mitigating measures proposed were applied proactively, these impacts could be substantially reduced. BLM should reanalyze the impacts in the preferred alternative with all of the mitigating controls applied to the emission estimates to quantify the benefit of applying these controls earlier rather than later.

R-7: BLM has reanalyzed air impacts resulting from project-related activities under scenarios that would result in greater than 50% emission reductions from compressor engines and the effect this would have on reducing impacts to visibility at specific Class I and II airsheds within the Project Area. This analysis also considered comparisons to prevention of significant deterioration (PSD) increments to quantify the benefit of further emission controls. The results of these analyses are contained in the Air Quality and Climate section of Chapter 4, the Air Quality Appendix, and the Supplemental Air Quality Analysis.

C-8: BLM should use caution when applying a 65 percent reduction to Alternative F to estimate the impacts from Alternative G. Spatial and temporal distribution is an important element in estimation of impacts.

R-8: While applying a 65 percent reduction may not be directly linear due to variables such as photochemistry, well locations, etc., it is an appropriate means of assessing the potential impacts to air quality that would result from implementation of Alternative G on a regional basis.

C-9: Page 3-2, Table 3-1. It appears that the form of the ozone standard is 8-hour rather than 1-hour. Please remove reference to annual PM10 National Ambient Air Quality Standard. On September 21, 2006, EPA announced final revisions to the National Ambient Air Quality Standards for particulate matter, which were published in the Federal Register on October 17, 2006, and took effect on December 18, 2006. The revision not only strengthened the 24-hour, PM2.5 standard from 65 to 35 $\mu g/m^3$, but also revoked the annual PM10 standard of 50 $\mu g/m^3$. EPA retained the existing annual PM2.5 standard of 15 $\mu g/m^3$ and the 24-hour PM10 standard of 150 $\mu g/m^3$. The state of Wyoming will enter into rulemaking to revise the Wyoming Ambient Air Quality Standards, but as the state has not yet done so, the Wyoming Ambient Air Quality Standard for 24-hour PM2.5 should be listed as 65 $\mu g/m^3$, and the annual PM10 standard should be listed as 50 $\mu g/m^3$.

R-9: BLM is aware of the changes that were made to certain air quality standards; however, these changes had not been made prior to the printing of the DSEIS. These changes have been reviewed, and the appropriate updates have been incorporated into the FSEIS.

C-10: Page 3-7, Table 3-2. Please remove the reference to 1-hour averaging time for ozone in the table. EPA published a final rule on August 3, 2005, identifying areas for which the 1-hour ozone standard was revoked. In that notice the 1-hour ozone standard was revoked, effective June 15, 2005, for all areas of Wyoming. WYDEQ-Air Quality Division then completed the process to remove the 1-hour standard from Wyoming Air Quality Standards & Regulations. That action was completed, and the effective date for the removal from the regulations was January 30, 2006. As a result, there is no federal 1-hour ozone standard that applies to Wyoming and there is no state 1-hour ozone standard that applied to Wyoming.

R-10: The data in Table 3-2 are referenced to national and state of Montana air quality standards. A footnote has been added which states that the national 1-hour ozone standard does not apply to Wyoming.

C-11: Page AIR-5: Last Paragraph. Short-term (24-hour) modeling exercises are not endorsed as a viable

tool in predicting short-term ambient impacts from fugitive dust particulate emissions, as the recommended EPA dispersion models have not been shown to work well when evaluating short-term fugitive particulate emissions. Please include a discussion of this within the text of the document.

R-11: The referenced text refers to the air quality model that was conducted for the coal review for the states of Montana and Wyoming and is a summation of the results of that study.

C-12: Page 3, AIR-II, Emission Source Groups. Background concentrations are used as an indicator of existing conditions in the region and are assumed to include emissions from industrial sources in operation and from mobile, urban, biogenic, and other non-industrial emission sources. Therefore, it is inappropriate to include sources such as those identified by the Environmental Defense Fund in the emissions inventory, as those sources were in operation during the year in which background data were collected and are accounted for in the monitored background data.

R-12: The emission sources identified by the Environmental Defense Fund that were in operation during the base year (2004) and located in the modeling domain are included as part of the emissions inventory. They are listed as a separate source group only to highlight that emissions from those sources were incorporated into the analysis. Base year emissions for the FSEIS air quality modeling effort are predicated on permitted emissions data obtained from each state and the Western Regional Air Partnership emissions inventory database for emission sources within the modeling domain. Monitored background data were not used in development of the base year emissions.

C-13: Include language that states that the threshold values used for visibility and acid deposition are simply screening thresholds. They should not be interpreted to be standards as there are no applicable local, state, tribal, or federal regulatory standards for either visibility or acid deposition.

R-13: The referenced text states that the values used to evaluate visibility and acid deposition are "thresholds" The text does not imply that they are standards.

C-14: Existing Air Quality, page 3-2: "Although monitoring is primarily conducted in urban or industrial areas and may be relatively higher than expected in the rural areas of the state, the data are considered representative of existing background air pollutant concentrations throughout the Planning Area." As stated above, pollutant background concentration levels were based on several monitoring sites generally located either in urban areas or near industrial facilities where elevated concentrations would be measured. This sentence acknowledges that the background is conservatively high. A high background concentration may show a false violation of an applicable ambient air quality standard.

R-14: The referenced text states that the monitored data were not used in conducting the Powder River Basin Coal Review Current Air Quality Condition air quality analysis (ENSR July 2005). The background emissions used for this particular air quality model and air impact analysis were developed from the state and local air quality monitoring system database.

C-15: Air Quality and Climate, Alternative A, Mitigation, page 4-30, "Electric Compression. Using electric-powered compressor motors in place of the typical natural gas-fired compressor engines could eliminate direct NOx emissions from compressor station locations." The Alternative A air quality mitigation measures are the same for all alternatives. Electric compressors would reduce local air pollution; however, the electricity generated to run these units is likely generated by a nearby fossil-fuel-fired utility. If there is an air quality issue on the project level (i.e., locally within about 1 km), then electric compressors may be a viable mitigation measure. However, long-range transport issues, such as visibility in Class I areas, may be adversely affected because the emissions have effectively just been moved to a tall stack (at a power plant) and will have a greater transport capability.

R-15: BLM recognizes that the use of electric engines for compressors as an air impact mitigation measure is only effective at the local level and does not eliminate the potential for emissions at the point where the electricity is generated. The statement referenced correctly points out that the use of electric motors for compressors would only be effective in eliminating "direct" NOx emissions from compressor station locations.

C-16: The DSEIS, under Alternative H implements an air quality impact screen that requires operators to submit air quality monitoring data to BLM for review. This requirement suggests that BLM has the authority to regulate air quality. While BLM should consult with MDEQ and EPA regarding its air quality concerns and an operator's compliance with the applicable air quality laws, BLM does not have the authority to regulate air quality. BLM should allow CBNG activity provided air quality is being protected

per the legal avenue of federal and state air regulations already in place.

R-16: The authority for issuing air quality permits and implementing air quality regulations lies with MDEQ. However, BLM does have a responsibility to evaluate whether project-related activities would result in an exceedance of air quality standards or an unacceptable impact to air quality. BLM also has the authority to implement mitigation measures through the alternative selection process, the use of conditions of approval for APDs, or the use of lease stipulations. BLM would work with MDEQ and EPA in determining what mitigation measures would be most effective in addressing impacts to air quality and how or when those measures should be implemented.

C-17: The air quality impact screen should be eliminated in its entirety because it does not accurately portray CBNG air emissions. First, most CBNG-related air emissions are local impacts. Due to the relatively short stacks of compressor engines and ground-level generation of PM_{10} emissions from construction activities and road travel, air quality impacts occur very near the point of emission. In fact, compressor station maximum impacts generally occur on the fenceline, or within a couple hundred meters of the fenceline. Because of CBNG activity emission characteristics, monitoring would show impacts from non-CBNG activity unless the sources were in close proximity. Monitoring would show when other non-CBNG sources were becoming problems. Second, DEQ already requires a cumulative type analysis when a CBNG facility applies for an air quality permit. Emission sources within 10 km are modeled to determine local impacts. This type of analysis is appropriate for the reasons mentioned above about CBNG activity emission characteristics. If the modeling analysis showed a potential violation of the standard, the project either would not be allowed, or the applicant would have to reduce emissions and ambient concentrations. Having BLM review the air quality status would be redundant and would create an additional unnecessary burden.

R-17: See R-14 and R-16. Additionally, while it is true that impacts from individual CBNG emission sources, such as compressors, are local, the combined impacts to air quality from hundreds of compressors could have an impact to air quality that would not be addressed by individual air quality permits or analyses conducted for individual emission sources. For this reason, the air quality impact screen would be a necessary component that would allow for evaluating air quality impacts on a more regional level than would be conducted in conjunction with the permitting process for individual emission sources.

C-18: Please define/explain when air modeling would be appropriate, what air modeling software would be acceptable, and what the protocol would be for air quality field modeling (i.e., explain how BLM would prefer to receive data in plan of development [POD] submissions).

R-18: The type of air quality modeling that BLM proposes is a model that would be updated annually to assess potential changes in air quality resulting from project-related activities on a regional basis. MDEQ would conduct the annual modeling and would determine which model it deemed best suited to evaluate potential changes in air quality. It is anticipated that data submitted to MDEQ in conjunction with applying for an air quality permit would be sufficient for conducting the annual modeling. Should additional data be required, BLM would let operators know when they submit their plans of development.

C-19: Regarding PSD increment analysis, the SEIS states that "an analysis of this sort is beyond the scope of this project." The air quality of the Northern Cheyenne Reservation is greatly valued, as evidenced by attaining Class I status. Therefore, an air increment analysis is very much needed. For instance, the reservation lies just north and west of the areas expected to have the most development within the Powder River RMP. It is even stated in Chapter 3 that Rosebud and Bighorn counties would likely have the most CBNG development and production. Of particular concern is the fugitive dust and exhaust from construction activities and operations such as compressor stations and how these activities would affect particulate matter and visibility.

R-19: Conducting a PSD increment analysis would be beyond the scope of the SEIS. A PSD increment analysis that includes the Northern Cheyenne Reservation is being conducted by EPA and MDEQ. As part of the air quality impact analysis, BLM has modeled the level of development that eliminates visibility impacts over the life of the project at Class I airsheds, including the Northern Cheyenne Reservation. This effort is based on actual well-to-compressor ratios currently being experienced in the Montana portion of the PRB. The results of these air quality mitigation modeling efforts are included in the Air Quality and Climate section of Chapter 4, the Air Quality Appendix, and the Supplemental Air Quality Analysis (BLM 2007).

The MDEQ requires that ambient air quality modeling be conducted for CBNG facilities (i.e. compressors) that exceed the 25-ton-per-year Montana Air Quality Permit threshold, regardless of the potential to emit from the facility. This is required to demonstrate compliance with the MAAQS/NAAQS. In addition, MDEQ requires that the modeling include a NO_X PSD increment analysis to demonstrate compliance with the Class I NO_X increment (specifically at the Northern Cheyenne Reservation) and the Class II NO_X increment, regardless of whether PSD applies to the facility.

C-20: The Northern Cheyenne Air Quality Division continuously strives to manage and maintain a current emissions inventory of known and suspected air pollutants within the exterior and posterior of the reservation. It is the Northern Cheyenne Air Quality Division's goal to protect the air quality on the reservation. The Northern Cheyenne Tribe requests that, at a minimum, BLM establish and maintain a productive relationship with the tribe to preserve the Northern Cheyenne Reservation's Class I airshed as part of its trust responsibility to the tribe.

R-20: BLM is committed to working with EPA, MDEQ, the Northern Cheyenne Tribe, and others within the Project Area to ensure that project activities do not result in exceedances of air quality standards. BLM has conducted additional modeling and revised the Air Quality screen to contain measures that are protective of the Northern Cheyenne Class I airshed.

C-21: The air modeling presented in the DSEIS included cumulative impacts from both the Tongue River Railroad (TRR) and the Roundup Power Plant. While these two projects are certainly within the realm of foreseeable development, it is believed that there are other potential projects that should also be considered in the model. For example, in October 2006, Montana Governor Brian Schweitzer announced the development of a $2 billion coal-to-diesel plant that would accompany the power plant south of Roundup. Air quality concerns associated with this facility would include sulfur dioxide, various nitrous oxides, carbon dioxide, hydrogen sulfide, and volatile organic compounds. This proposed project would ultimately have a long-term impact on the air quality of the planning area and should have been included in the model.

R-21: The proposed coal-to-liquids facility south of Roundup has no funding and no permits have been applied for (e.g. construction, siting). There is no information available such as parameters, size, or through-put that could be used in anticipating emissions. The project is considered speculative.

C-22: We are concerned about the increased impacts on visibility that are predicted for the Northern Cheyenne and Crow reservations. Although BLM states in the Mitigation Measures section (under Preferred Alternative H, page 4-54), "As modeling and monitoring results become available, the BLM may adopt more stringent measures so predicted air quality impacts are avoided," it is likely that the predicted visibility impacts would have already occurred before modeling and monitoring results were available. Under the Air Quality Screen description (page 2-22), monitoring would take place on an annual basis. In an effort to ensure that visibility impacts would not be exceeded, we strongly urge BLM to work with MDEQ to shorten the monitoring interval from annually to quarterly. We also ask that BLM ensure that current and future PODs include mitigation measures to minimize the impacts of increased visibility problems before the PODs were approved.

R-22: See also R-19. BLM has conducted additional modeling to evaluate the effectiveness of control and mitigation measures to reduce impacts to visibility at specific airsheds within the project air modeling domain, including the Northern Cheyenne and Crow reservations. The results of that modeling are contained in the Air Quality and Climate section of Chapter 4, the Air Quality Appendix, and the Supplemental Air Quality Analysis Report. The air quality screen has been revised to include monitoring of compressor engine horsepower requirements and mitigation if the horsepower requirements should reach a level that modeling indicates impacts would occur.

C-23: While air quality from CBNG operations received some analysis in the DSEIS, there is no analysis of the additional emissions from operating trains along the railroad or emissions and dust from maintenance vehicles along roadways, should the TRR be built.

R-23: Air emissions resulting from the TRR were included as a reasonably foreseeable future action in the cumulative air impact analysis (see Chapter 4, Air Quality and Climate and the Air Quality Appendix).

C-24: The agency must analyze the cumulative effects from emissions of greenhouse gases (GHG) that result from permitted activities under the SEIS. (1) Quantify GHG emissions from past, present, and reasonably foreseeable oil and gas operations; (2) address the emissions as direct, indirect and cumulative impacts to the human environment for the

entire Powder River Basin; (3) consider lease stipulations and post-lease conditions of approval applicable to all oil and gas operations designed to reduce GHG emissions as components of the alternative analyses; (4) consider how climate change impacts ecological resiliency across the basin, and whether such impacts warrant enhanced ecological protections to ensure the landscape's long-term ecological viability; and (5) consider how climate change impacts may operate to constrain oil and gas field operations. BLM must factor the changes wrought by global climate change into its cumulative effects analysis concerning vegetation, wildlife, and water quality.

R-24: The assessment of GHG emissions and climate change is in its formative phase and many existing climate prediction models are global in nature. However a section has been added to Chapter 4 that addresses the quantitative contribution of GHG from the project, indirect impacts from the burning of the methane extracted over the estimated development period and cumulative impacts related to climate change. Impacts addressed include potential climate change impacts identified by the EPA at a regional scale. However, scientific uncertainty does remain, and the lack of proven scientific tools designed to predict climate change on local scales limits the ability to project potential future impacts of climate change on the resources found in the Powder River Basin. For additional information and the contribution of project direct and indirect impacts to this global issue see the Air Quality sections within Chapters 3 and 4 of the FSEIS.

C-25: The Supplemental Air Quality Analysis shows potential violations of the NAAQS and MAAQS for the Preferred Alternative from both direct project impacts and cumulative impacts. The modeling results indicate that there will be exceedances of the 1-hour NO_2 MAAQS under all scenarios of the Preferred Alternative when considering the impact from all sources on the Crow Reservation in Montana. The SAQA does not disclose the potential exceedances of the NO_2 MAAQS and PM_{10} NAAQS in the cumulative impact modeling for near-field impacts in Montana. Tables 5-1, 5-2 and 5-3 of the SAQA indicate that "[b]ackground is to be added to modeled impact for comparison to AAQS" and yet there are no background concentrations included in the tables. The background concentrations from Table AQ-1 of the Air Quality Appendix from the January 2003 analysis, when added to the projected concentrations from all sources for *all* Preferred Alternative scenarios results in predicted violations of the 1-hour NO_2 MAAQS and the 24-hour PM_{10} NAAQS for the Montana near-field grid. For example, Table 5-3 of the SAQA (p. 21) shows predicted 1-hour NO_2 concentrations of 1,589 $\mu g/m^3$ for the cumulative modeling run ("ALL Sources") for all of the Preferred Alternative H scenarios. Compared with the 1-hour MAAQS of 565 $\mu g/m^3$ and considering that the 1,589 $\mu g/m^3$ does not include the background concentration for NO_2 in Montana (117 $\mu g/m^3$ from Table AQ-1 of the SEIS Air Quality Appendix) these predicted impacts are huge at three times the MAAQS.[1] Similarly, the 24-hour PM_{10} cumulative impact concentrations from all of the Preferred Alternative H scenarios, when combined with the background concentration for PM_{10} (105 $\mu g/m^3$ from Table AQ-1 of the SEIS Air Quality Appendix), are two times the 24-hour PM_{10} NAAQS.

R-25: The tables in the printed copy of the SAQA were initially revised and an Errata sheet was provided in December of 2007. The revision was required to update model predicted impacts following the removal of an incorrectly identified emission source. The tables have been further revised to show background ambient air concentrations and initial base year modeling impacts and have been incorporated into the SAQA document. The background values presented in the Tables 5-1, 5-2, and 5-3 of the SAQA document were provided by MDEQ and are not the same as the Base Year background levels contained in Table AQ-1 of the SEIS Air Quality Appendix. The Base Year background levels were provided in Table AQ-1 to allow comparison of future impacts to Base Year impacts. The background levels provided by MDEQ are to be added to model predicted results for comparison to AAQS. The revised results indicate that air quality impacts from CBNG project sources would be below applicable air quality standards at all receptors; however, the results for Revised Alternative H show a maximum predicted level for 1-hour NO_2 of 544 $\mu g/m^3$ with a MAAQS of 565 $\mu g/m^3$ which indicates the potential for the standard to be exceeded. Cumulative impacts from the revised results show the potential to exceed the PSD increment for 24-hr PM_{10} and the 1-hr NO_2 AAQS at the Montana Near-field receptors, and the potential to exceed the 24-hr PM_{10} PSD increment at both the Northern Cheyenne and Crow reservations. A review of modeled sources contributing to these cumulative PM_{10} and NO_2 impacts indicates that coal mining activities in the region are the predominant contributing sources. Furthermore, the cumulative impacts include reasonably foreseeable future actions

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[1] 1,589 $\mu g/m^3$ + 117 $\mu g/m^3$ = 1,706 $\mu g/m^3$
1,706 $\mu g/m^3$ / 565 $\mu g/m^3$ = 3.1

(RFFA) sources which would be located on the Northern Cheyenne and Crow reservations. BLM has revised the Air quality Screen within the Preferred Alternative (H) to include additional control and monitoring measures that will allow for better tracking of project emissions to avoid exceedances of air quality standards.

C-26: The SAQA does not disclose the potential exceedances of the NO_2 MAAQS and PM_{10} NAAQS in the cumulative impact modeling for near-field impacts in Montana. Tables 5-1, 5-2 and 5-3 of the SAQA indicate that "background is to be added to modeled impact for comparison to AAQS" and yet there are no background concentrations included in the tables.

R-26: Tables 5-1, 5-2 and 5-3 have been revised to include background values for comparison against the air quality standards. The background values found in Tables 5-1, 5-2 and 5-3 should be used, not the values from Table AQ-1. The values in AQ-1 were used in the original model completed for the 2003 Final Montana Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment of the Powder River and Billings Resource Management Plans (Statewide Document). Elevated background levels were used in this analysis to represent many existing sources. Contrary to this approach, the air quality modeling conducted for this SEIS included all major existing sources and the background values used for most of the State of Montana to represent mobile sources, small stationary sources, and distant (outside of the modeling domain) large sources.

C-27: The BLM's emissions estimates for PM emissions from construction activities and travel on unpaved roads are based on the assumption that there will be 50% control of fugitive dust emissions (by watering). See, for example, SAQA Appendix at A-2, A-4, A-5, A-11, A-12. The requirement to cut fugitive dust emissions in half through watering of construction sites and roads should clearly be specified in the SEIS.

R-27: The use of dust control measures is addressed as a mitigation measure common to all alternatives within Chapter 2, Table 2-1. The control of dust is included in the preferred alternative. The following measures are required to reduce fugitive dust.

- Access roads, well pads and production facility sites constructed on soils susceptible to wind erosion will be appropriately surfaced to reduce fugitive dust emissions.
- Dust inhibitors will be used as necessary on unpaved collector, local and resource roads to reduce fugitive dust emissions to the air and resources adjacent to the road.
- To reduce dust, operators of federal leases would have to post and enforce speed limits for their employees and contractors.

In addition, the preferred alternative includes a best management practice (BMP) to encourage operators to work with local government to use dust suppression techniques on county roads.

C-28: The Supplemental Air Quality Analysis shows the potential for violations of the $PM_{2.5}$ NAAQS. The cumulative $PM_{2.5}$ modeled concentrations are over 75% of the 24-hour $PM_{2.5}$ NAAQS. Short-term $PM_{2.5}$ concentrations from direct project sources are over 60% of the 24-hour $PM_{2.5}$ NAAQS.

Previous modeling has shown that emissions from non-project sources of $PM_{2.5}$ result in 24-hour $PM_{2.5}$ concentrations of 44 $\mu g/m^3$. See Table AQ-4 of the Air Quality Appendix from the January 2003 air quality analysis. This suggests that ambient concentrations from non-project sources already exceed the 24-hour $PM_{2.5}$ NAAQS of 35 $\mu g/m^3$, at least according to the original modeling. It is not clear why the cumulative modeling in the SAQA now predicts significantly lower $PM_{2.5}$ concentrations than the previous modeling analyses. Tables 5-1, 5-2 and 5-3 show cumulative 24-hour $PM_{2.5}$ concentrations of 6-7 $\mu g/m^3$. The fact that non-project source concentrations were formerly 7 times the total cumulative source concentrations in the 2007 SAQA (and exceeded the 24-hour $PM_{2.5}$ NAAQS) and now the cumulative modeled impacts are only a fraction of the NAAQS must be more clearly explained in the SAQA.

R-28: The modeling conducted for the SAQA utilized recalculated project emissions based on updated information of current CBNG production methodologies being used in Montana, and removed emissions from maintenance and operations that had inadvertently been counted twice in the DSEIS modeling. The recalculated project emissions were less than those used in the DSEIS modeling. Additionally, placement of project CBNG emissions sources were reconfigured to better reflect anticipated locations of CBNG activities. The combined effects of the recalculated emissions and the source reconfiguration lead to reduced model predicted impacts. The difference between the 2003 non-project source emissions and the non-project source emissions utilized in the SAQA air modeling is due to several changes between the models. The SEIS and SAQA utilized an updated meteorological base year (2002), updated emission sources to the most current

year (2004) at the time of conducting the DSEIS air modeling, and revision to RFFA source point locations within the Northern Cheyenne and Crow reservations. Each of these changes could feasibly lead to the observed reduction of impacts for non-project sources. Additionally, the reduction in project emissions due to the recalculation would provide reduced cumulative impacts when a project source was the dominating emission source to a receptor. Direct comparison of cumulative impacts and non-project source impacts with AAQS is done by adding the background values provided by MDEQ and contained within Tables 5-1, 5-2, and 5-3 to the modeled impacts.

C-29: The SAQA describes PSD increment violations for all Preferred Alternative H Scenarios for 24-hour PM_{10}. The Montana Near-Field shows a potential to exceed the Class II PSD increment for 24-hour PM_{10}. There is also a potential to exceed the Class I PSD increment for 24-hour PM_{10} at the Northern Cheyenne Reservation. The BLM must consider the PSD increments as important and legally binding Clean Air Act requirements and it must provide for compliance with these requirements in the statewide EIS and amended RMPs.

R-29: See also R-19. The SAQA modeling results do not show the potential for direct project CBNG sources to exceed PSD increments on Class I or Class II sensitive areas. However, the cumulative impacts, which include RFFA CBNG well development on the Northern Cheyenne and Crow Reservations, could have the potential to exceed certain PSD increments. The BLM will use the air screen to identify and address any potential exceedances, and will work with MDEQ, EPA and Tribal Agencies to minimize the potential for exceedances. Also, comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern for potential impacts and do not represent a regulatory PSD Increment Consumption Analysis. Such an analysis would be conducted by the appropriate air regulatory agency.

C-30: The results of the visibility analyses for all of the Preferred Alternative scenarios show visibility impacts from direct project impacts and cumulative impacts at the Northern Cheyenne and Crow reservations. None of the preferred alternative scenarios protect against visibility impairment at these Class I and Class II locations. Specifically, when measured by the 0.5 deciview (dv) metric of change in light extinction, visibility degradation will occur at the Northern Cheyenne and Crow reservations under *all* modeled scenarios (i.e., Alternative H Revised, Scenario 1, Scenario 1A, Scenario 2 and Scenario 2A) from project CBNG construction source impacts alone, from project CBNG operations source impacts alone and when considering cumulative source impacts.

R-30: The FLAG guidance document utilizes a value of 1.0 deciview as the basis for determining if a "just noticeable" impact to visibility has occurred. BLM has used the value recommended by FLAG. For additional information see the Dispersion Modeling Protocol for Ambient Air Quality Impact Assessment (BLM 2006) under the heading of "Air Quality Related Values/Visibility".

C-31: The Supplemental Air Quality Analysis does not address the ecosystem impacts from nitrogen and sulfur deposition for the Preferred Alternative. The BLM claims these impacts are insignificant based on an acceptability threshold of 3 kilograms/hectare-year (kg/ha-yr) and 5 kg/ha-yr for nitrogen and sulfur deposition respectively. However, these impacts are considered significant when compared to the National Park Service's (NPS) Class I area "Deposition Analysis Thresholds" of 0.005 kg/ha-yr for both nitrogen and sulfur deposition.

R-31: The USFS (USFS 2000) has indicated that deposition values below thresholds of 3 kg/ha-yr and 5 kg/ha-yr, for nitrogen and sulfur deposition respectively, will not lead to significant air quality related value impacts. Deposition predictions were based on USFS prediction methodologies as described in the Dispersion Modeling Protocol for Ambient Air Quality Impact Assessment (BLM 2006) prepared for the DSEIS, and were therefore compared to threshold level values recommended by the USFS.

C-32: The Supplemental Air Quality Analysis does not include an analysis of impacts on ground-level ozone concentrations.

R-32: As stated in the Dispersion Modeling Protocol for Ambient Air Quality Impact Assessment (BLM 2006) prepared for the DSEIS, CBNG activities would lead to insignificant levels of volatile organic compounds, precursors that chemically combine with other atmospheric pollutants to form ground level ozone, therefore it was not necessary to include ozone in the air quality modeling..

C-33: The Supplemental Air Quality Analysis does not address potential methane mitigation as a means to minimize GHG impacts from CBNG development in the Powder River Basin. BLM should consider and adopt the mitigation strategies identified by EPA and others for minimizing methane emissions from oil and gas development.

R-33: See also R24. Methane is the predominant resource being developed and captured for sale. As such, it is anticipated that producers will make efforts to ensure that minimal amounts are lost to the atmosphere as fugitive emissions of methane represent a lost revenue source. Furthermore, EPA has established a voluntary program to reduce methane emissions in the natural gas industry. This program, known as the Natural Gas STAR Program (Gas STAR) is a voluntary partnership between EPA and the natural gas and oil industries to reduce emissions of methane from the production, transmission, and distribution of natural gas. The Final SEIS includes additional BMPs (mitigation measures) from EPA's Natural Gas STAR Program that could be used to reduce fugitive methane emissions from compressor stations, metering and regulating stations and other field production activities.

C-34: Methane is leaking in the Tongue River Reservoir. The methane keeps the reservoir from freezing in the winter where the gas is leaking. The reservoir used to freeze in the area it is open now. The amount of methane leaking needs to be quantified. The carbon dioxide from CBM development should also be quantified as well as the cumulative impacts of carbon dioxide from other potential regional projects, such as the Tongue River Railroad, the coal plant at Hardin and Colstrip. The supplement should determine greenhouse gases emitted from the proposed Highwood Generating Plant being considered in Great Falls. In addition there is a coal-to-diesel facility being proposed in the Great Falls area as well.

An important aspect that needs to be looked at is the increase in coal seam fires because of CBM development and how much carbon dioxide is being added to the atmosphere from this source. Not only should this be controlled, it needs to be quantified for the cumulative impacts of greenhouse gas emissions.

R-34: See also R-1, R-21 and R-24. A discussion of methane seepage to the surface is contained in the Geology and Minerals section of Chapter 3 under the heading "Methane Seepage, Migration, and Venting." The Wyoming BLM (Buffalo Field Office) has been conducting a methane seepage monitoring program for over five years. To date, this BLM study has not found indications of surface-seepage. Additionally, a discussion of the potential for impacts from coal seam fires can be found in the Geology and Minerals section of Chapter 4 under the heading of Impacts From Management Common to All Alternatives.

A discussion of greenhouse gases and climate change issues is included within the Air Quality sections of Chapters 3 and 4 of the FSEIS.

C-35: The Hardin plant was recently fined for exceeding the air quality limits. The air quality analysis in this SEIS is done for normal pollution limits. We believe that the analysis should include data for what happens when Hardin exceeds the standards again.

R-35: Many of the sources included in the base year modeling analysis and RFFA sources in the alternative development year (ADY) utilize permit level emissions rates rather than actual emissions rates. In general, most facilities have actual emissions that are significantly less than their permitted levels, in order to maintain sufficient overhead to allow for process modifications that may slightly increase actual emissions, but would not require modification of their permit. The use of permitted levels in the modeling analysis is considered to be conservative enough to allow for temporary excursions over permitted levels by a modeled source when considering that other modeled sources would be operating well below their permitted levels at the same time.

C-36: According to the revised Alternative H some of the Reservations will be impacted. My concern here is the impact on any residents within those impacted areas. Are they people who reside there that have any type of ailment, disease, condition, that would be impacted by the dust in the air? Has any plans been put into effect for these people to decrease the impact on them during the time of production and operation and maintenance? How does this whole operation in its entirety affect the people, their health, welfare and livelihood?

R-36: The area encompassed by the project boundary includes populated regions which would have persons that could potentially be susceptible to certain health effects from airborne pollutants. Attachment A of the Air Quality Appendix- Part 2 to the DSEIS is entitled, "Review of Information on Health Effects," and discusses reported health effects of exposure to particulate matter. Attachment B of the Air Quality Appendix – Part 2 to the DSEIS, entitled "Review of Mitigation Measures," provides a discussion on methods which could be used to reduce potential project air quality emissions to avoid any adverse health impacts. Further, the AAQS are set to be protective of public health with a margin of safety, accounting for health effects on some of the most sensitive members of the population.

C-37: It is not clear if the emissions from the nearby operating Colstrip and Hardin coal-fired generating plants were included in the SAQA model's baseline data.

R-37: The DSEIS and its supporting documents including the Air Quality Appendix, and the Air Quality Technical Support Document fully describe the sources included in the baseline modeling. The coal-fired power plants at Hardin and Colstrip are included in the baseline modeling.

C-38: The DSEIS SAQA states that "to reduce dust, operators of federal leases would have to post and enforce speed limits for their employees and contractors. Operators could work with local government to use dust suppression techniques on roads." The issue of road dust should be directly addressed in a manner that controls and reduces fugitive dust.

R-38: See also R-27. Reducing road traveling speeds and use of dust suppression methods are required under the preferred alternative. These methods are effective controls accepted by EPA to minimize the potential for particulate matter (see Table AQ-13, page AIR-33 and Supplemental Air Quality Analysis, page A-2)

C-39: As the Air Quality Screen is implemented, EPA recommends that BLM take measures to ensure that interested parties are adequately involved in this endeavor. EPA recommends the FSEIS and subsequent Record of Decision include a mechanism for public disclosure of the future air quality modeling, monitoring data collected, and horsepower threshold calculations completed under the Revised Air Screen. Data and analysis conducted under the Air Quality Screen will be important to share with relevant stakeholders including the Northern Cheyenne Reservation, the Crow Reservation, the MDEQ, and the general public. The data and analysis will also be important for energy companies in planning future development in the area.

R-39: BLM will make public on the Miles City Field Office website http://www.blm.gov/mt/st/en/fo/miles_city_field_office/cbng/monitoring.html the results of future air quality modeling, monitoring data collected, and horsepower calculation conducted under the Revised Air Quality Screen. The summary of ongoing monitoring related to coal bed natural gas is scheduled to be updated every six (6) months.

C-40: The cumulative impact analysis included in the SAQA suggests the potential for exceedances of the Montana Ambient Air Quality Standard (MAAQS) for NO_2. BLM's Revised Air Quality Screen is designed to identify and mitigate these potential impacts before they occur. To address this potential for exceedances, the Revised Air Quality Screen notes that "BLM would approve additional APDs only if it can be demonstrated that they would not contribute to the exceedances of air standards." (SAQA, page 2). Nonetheless, the SAQA suggests the need for BLM to closely monitor the NO_2 levels to ensure compliance of future drilling activities with the MAAQS. EPA recommends BLM conduct near-field air quality modeling, such as AERMOD, prior to approval of any project-specific development proposals. EPA understands near-field air quality modeling may already be incorporated into the permitting process by MDEQ. If so, EPA suggests the Final SEIS include a discussion of this process and clarify that additional near-field modeling will occur prior to approval of project-specific development.

R-40: MDEQ conducts project specific near-field air quality modeling as well as an evaluation of potential cumulative effects for each proposed air quality permit. A detailed discussion of this process is included in Chapter 3 of the FSEIS within the Air Quality section. This process is also identified in Chapter 2 within the Air Quality Screen and in Chapter 4 as part of processes in place to protect air quality. See R-19.

C-41: Given the results disclosed in this Supplemental Air Quality Analysis, EPA recommends BLM work with the operators and MDEQ to fund and install additional NO_2 monitors in the area.

R-41: Addressed under R-5.

C-42: The SAQA uses a NOx emission factor of 1.0 or 1.5 gram/brake horsepower-hour (g/bhp-hr) for compressor engines, depending on the scenario. If these emission rates form the basis for producing modeling results that show an acceptable level of impact for the project, then these emission rates should be made enforceable limits (through regulation, permit condition, or some other enforceable mechanism).

R-42: The horsepower requirement thresholds were incorporated into the air quality screen as a means to track and monitor levels of potential impacts. Air quality modeling has shown that emissions below the horsepower threshold would not have the potential to cause an exceedance of ambient air quality standards or have an impact on visibility. As horsepower requirements approach the threshold, BLM will consider further mitigation measures and/or

requirements that would be enacted to minimize the potential for exceedance of any air quality standard. The MDEQ is the permitting authority for air quality in the State of Montana and will ultimately decide on the allowable emissions for each permitted unit. Currently, they are issuing permits with a NOx emission factor of 1.0 g/bhp-hr; however they have the flexibility within regulation to issue permits with a higher emission factor. For this reason, BLM has selected a conservative horsepower threshold as an effective means to monitor potential impacts.

C-43: The emission calculations for road dust particulate emissions throughout the inventory use an old (1998) version of AP-42 Section 13.2.2. This section has since been revised three times. The 1998 version used in the SAQA gives a more conservative (higher) estimate of PM_{10} and $PM_{2.5}$ emissions. Therefore, particulate impacts due to road dust may be over-predicted in the modeling analysis.

R-43: The calculations of potential air emissions associated with project activities were intentionally conservative. The continued use of previous (1998) emission factors was done to maintain consistency with the prior air modeling conducted for the 2003 Statewide EIS. The road dust particulate calculations may result in a conservative estimate of PM_{10} and $PM_{2.5}$ emissions.

C-44: The sulfur dioxide (SO_2) emission calculations for gas flaring use an AP-42 emission factor for combustion of pipeline quality gas. This assumes low sulfur content in the fuel. While the literature suggests that CBNG is likely to be low in sulfur, in conventional oil and gas project operations, the gas being flared is likely to have high sulfur content unless the gas has undergone a sweetening process. Due to the site-specific variation in sulfur content of fuels, an analysis of sulfur content of a representative sample of CBNG that would typically be flared would be preferable to the use of the AP-42 emission factor.

R-44: As stated in the comment, literature sources indicate that sulfur content of CBNG is typically either very low or below laboratory analytical detection limits. The predominant sources of flaring will occur during CBNG well development. Based on the considerations that CBNG well development will be the greatest source of flaring and given the literature descriptions of CBNG as containing little or no sulfur, it was reasonable to use the AP-42 emission factor for natural gas flaring. It should also be noted that air model predicted impacts of sulfur dioxide were all well below any regulatory threshold limits.

C-45: The emission inventory in the SAQA for "Conventional Oil and Gas Operations" does not appear to include emissions from compressors or dehydration units. The BLM should confirm that compressors or dehydration units are either 1) included in the emissions inventory, or 2) not expected to be sources of emissions in the Conventional Oil and Gas Operations.

R-45: Emissions from compressors and dehydration units were accounted for in the emission inventory. The calculations presented in Appendix B of the Argonne Technical Support Document (TSD) (Argonne 2002) for conventional oil and gas emissions included a comment under the compressor calculations stating, "*Note: Not applicable, as compressor installation will coincide with compressor installation for CBM operations. No additional compression will be required.*" The comment under dehydrator calculations states, "*Note: Same as above. The small amount of conventional gas would be mingled with the CBM gas in the basin. No appreciable increase of emissions is expected.*" The above notes reference an email from C. Martinez (WGR) to K. C. Chun entitled, "Basic Data for Emission Estimation" dated March 30, 2001. These assumptions remain accurate. Furthermore, existing sources, including compressors for conventional oil and gas activity throughout the modeling domain, are included as part of the emission inventory, see the emission inventory tables in the Air Quality Appendix.

C-46: The SAQA uses an emission factor for total suspended particulate (TSP) from AP-42 Section 13.2.3 to calculate fugitive dust emissions from construction operations. PM_{10} and PM2.5 are then determined by multiplying TSP emissions by ratios determined in the 2002 TSD prepared by Argonne National Laboratory. These ratios are 26 percent for PM_{10} and 3.9 percent for PM2.5 (15 percent of PM_{10}). The 26 percent PM_{10} ratio from the Argonne TSD is the same as the ratio in AP-42 for unpaved road emissions from vehicle use. However, the 26 percent PM_{10} ratio is much lower than ratios published in AP-42 for activities more similar to construction operations. AP42 Section 13.2 refers the user to other AP-42 sections for more refined calculation of PM emissions from construction operations. The referral for construction operations involving surface disturbance is Section 11.9. Table 11.9-2 gives a PM_{10} to TSP ratio of 60 percent for grading and 75 percent for bulldozing of overburden. The TSP to PM2.5 ratio from the Argonne TSD (3.9 percent) is within the range of values given in Table 11.9-2 (3.1 percent for grading and 10.5 percent for bulldozing).

R-46: The particulate emission factors were carried forward from the air modeling conducted for the 2003 Statewide FEIS and described fully in the 2002 Air TSD. These same emission factors were used to maintain consistency with the air modeling presented in the 2003 Statewide FEIS. Heavy equipment fugitive dust emissions account for less than five percent of total project particulate emissions. The difference in using the ratios suggested would not likely result in a change to modeled particulate matter impacts beyond those already predicted based on the current model.

C-47: Sulfur dioxide (SO_2) emission calculations for diesel exhaust use emission factors ranging from 0.85 to 0.93 g/hp-hr. This indicates the use of diesel fuel with sulfur content of 2,500 ppm or higher. If the results of the modeling analysis suggest that the impact of SO_2 emissions to ambient air quality or to visibility conditions are higher than acceptable levels, then SO_2 emissions could be lowered and impacts mitigated by requiring the use of low sulfur diesel (500 ppm) or ultra-low sulfur diesel (15 ppm) in project equipment that burns diesel fuel. Such a requirement to limit sulfur content in diesel fuel should be codified by regulation, permit condition, or some other appropriate and enforceable mechanism.

R-47: The results of the air quality model do not indicate the potential to exceed any sulfur air quality standard or regulatory threshold limits. The higher sulfur content fuel was utilized for the air quality model to be conservative. The use of low sulfur and low nitrogen fuels is identified as a potential mitigation measure within the Air Quality and Climate section of Chapter 4 under the heading of Mitigation.

C-48: The SAQA states that model results indicate that applicable air quality standards are not expected to be exceeded. However, receptors on Reservation lands have been excluded from the modeling analysis due to the proximity of these Receptors to emission sources. Even with the exclusion of these receptors, the figures (maps) in Appendix D indicate localized high air quality impacts from sources, particularly for pollutants for which short-term averages (e.g., 1-hour, 3-hour, 8-hour) have been established as standards. The receptors that have been excluded from the modeling analysis are representative of areas that should be considered ambient air. Therefore, comparison of modeled impacts for these receptors to the applicable ambient air quality standards should be represented in the analysis and documentation.

R-48: The purpose of establishing the near-field receptors is to characterize the overall air quality conditions in the PRB as a result of this development. The modeling for assessing potential impacts at any facility fence line, which is required for obtaining an air permit, would be determined by MDEQ. Consequently, all near-field receptors that were located within 1 km of a modeled project emission source were removed from the near-field grid for the SAQA analysis. While the Crow and Northern Cheyenne Reservations are discussed under the far field analysis this is due to their airshed classifications, sensitive Class II and I respectively. In actuality these two receptor groups would be considered near field receptors based on their close proximity to the modeled project emission sources. The receptors that were removed due to being within 1 km of the project emission source would represent fence line modeling results and not regional scale which was the objective of the modeling effort. Note the Final Protocol and SAQA state certain receptors (those within 1- km of emission sources will be removed from the near field modeling domain). This provision was accepted by the stakeholders as a feature of the air quality modeling proposed and subsequently completed for the SEIS.

C-49: The documentation should be made clearer with regard to the expected net change in emission from the base year. Table 3-2 from the Technical Support Document (TSD) suggests project emissions of particulate matter less than 10 microns (PM_{10}) will be increasing while SO2 and oxides of nitrogen (NOx) emission will decrease only because of the offset of increased 2004 construction. Figure 2-5 indicates that emissions in the airshed will increase. The documentation is not clear as to what the overall change in air basin emissions will be.

R-49: Table 3-2 within the TSD depicts visibility impacts predicted for the Base Year using the Method 6 approach and does not provide any information as described in the comment. There is not a figure 2-5 in either the TSD or the SAQA documents. However, from Table 5-3 of the SAQA document, a comparison of Base Year to ADY 20, model predicted impacts shows that ADY 20 impacts are less than those for the Base Year. This would result from emission levels for that year which are less than the Base Year. The SAQA document is meant to provide supplemental information in support of information already contained within the FSEIS and its existing supporting documents. The Air Quality Technical Support Document (ALL 2007) for the FSEIS indicates the emission source groups and their respective contributions to air

emissions for the modeled base year. Additionally, the relative change in emissions between the Base Year and ADY 20 can be seen in the tables presented in the FSEIS, Air Quality Appendix – Part 2, and the SAQA.

C-50: The documentation should be made clearer with regard to the presentation of receptor impacts. Tables 5-2 and 5-3 of the SAQA include a column of "All Sources MT Base Year 2004." However, the values appear to be only for the near-field receptors (from Table 5-1 and are the highest in the domain) and not receptors specific to the area. The reader is required to refer back to Table 4-1 to see the difference from base to project year. Tables 5-2 and 5-3 of the SAQA should be revised to include the appropriate receptor values from Section 4.

R-50: Tables 5-2 and 5-3 in the SAQA have been revised to include appropriate area base year information.

C-51: Tables 5-5 and 5-6 show that under all scenarios visibility in the Northern Cheyenne Class I area and in the surrounding areas is projected to get worse as compared to the base year. Because the CBNG project represents many permitted activities, the cumulative 10 percent criteria should be applied to interpreting the results of the modeling analysis.

R-51: The "Issues, Impact Types and Criteria" and "Air Quality Modeling Assumptions" Sections of the SEIS Air Quality analysis discuss criteria and thresholds used for interpreting visibility modeling results. The Supplemental Air Quality Analysis is designed to disclose the level of CBNG activity that creates a potential impact greater than 10% on the Northern Cheyenne Reservation. As shown in the supplemental air quality analysis there are no impacts greater than 10% under Scenario 1A and Scenario 2A. As a result of these findings the Air Quality Screen component of the preferred alternative has been modified to include method to evaluate the need and effectiveness of additional mitigation before impacts greater than 10% occur at the Northern Cheyenne Reservation.

Aquatic Resources

Comment 1 (C-1): The DSEIS does not include bicarbonates in its monitoring criteria. Bicarbonate has been shown to be toxic to fathead minnows and could be toxic to other species. Adding bicarbonate to the monitoring of water quality and adapting the fate of produced water accordingly, will address this deficiency.

Response 1 (R-1): BLM will conduct appropriate monitoring activities stipulated in the permitting of individual CBNG development sites, as governed by federal, state, or local permitting laws. The Aquatic Biota Monitoring Plan (November 9, 2006) has been developed by an aquatic task group for Montana and Wyoming. The plan addresses fish, macro-invertebrates, periphyton, water quality, habitat, and amphibians/reptiles. This plan includes funding research for bicarbonate toxicity effects on fishes. Preliminary results from MFWP and U.S. Geological Survey (USGS) indicate that high bicarbonate levels can impact fathead minnows. They are conducting further research on other aquatic species the summer of 2008, but the research is not complete at this time. Information on aquatics monitoring is found in the Monitoring Appendix: Table Mon-1.

C-2: Discharge of produced water may decrease the seasonality of streams, wetlands, and ponds. Additional research and monitoring of fish, aquatic reptiles, and amphibians is encouraged to identify and address potential impacts resulting from changes in flow regimes and the seasonality of wetlands. A water monitoring system that will allow quantification of CBNG-produced water discharge into the system at any given time is needed. The availability of data pertaining to quantity or water volume will assist with the study of potential impacts to aquatics, but data have not been readily available in the areas of development.

R-2: Additional monitoring requirements have been added to the monitoring table (see the Wildlife and Aquatics sections of the Monitoring Appendix). MDEQ requires monitoring of water quality and quantity in association with Montana Pollutant Discharge Elimination System (MPDES) permits. The preparation of MPDES permits includes a non-degradation analysis related to the change in flow. Data collected in association with MPDES permits are available through EPA's STORET database. The Montana BLM has established a CBNG monitoring website where all monitoring reports are posted (http://www.blm.gov/mt/st/en/fo/miles_city_field_office/cbng/monitoring.html).

C-3: Groundwater drawdown will cause pools in streams to dry up, affecting fish and other aquatic wildlife (amphibians and reptiles). Does a CBNG operator's responsibility to mitigate for loss of water extend to public water bodies? A timeline should be required for supplementation that would reduce the amount of time that instream flows are compromised.

R-3: CBNG production is generally several hundred feet deep. Additionally both modeling and

monitoring have shown little if any effect on aquifers other than the coal seams; therefore, it is unlikely that surface pools would be impacted. See Chapters 3 and 4, Hydrological Resources, for more discussion.

C-4: The DSEIS does not address the impacts of impoundments on fish and water quality. An index of biotic integrity developed for Montana prairie streams (Bramblett et al. 2005) should be included as a measure of stream health as part of the aquatic monitoring and protection plan. What monitoring has been done to evaluate the impact of effluents on invertebrates, larval fish, or adult fish in the localized area below these outflows? Are there screening mechanisms in place that help BLM determine if the operator's plan of development should be altered?

R-4: An aquatic task group has been formed for CBNG development in Montana and Wyoming. Representatives from BLM, MFWP, Wyoming Game and Fish (WYGF), EPA, MDEQ, WYDEQ, Montana State University (MSU), FWS, and Montana Natural Heritage are all crucial partners of the task group. The Aquatic Biota Monitoring Plan (2006) was developed and has been implemented for aquatic species from 2005 to present. The plan addresses fish, macro-invertebrates, periphyton, water quality, habitat, and amphibians/reptiles. The potential for project-related CBNG activities to affect fish and water quality is addressed in Chapter 4, the Hydrological Resources and the Wildlife, Aquatic Resources sections. Additional information on the results of past water quality sampling and aquatic surveys conducted within the Planning Area is contained within the Hydrological Resources section and the Wildlife, Aquatic Resources, section of Chapter 3.

C-5: Yellowstone cutthroat trout, brown trout, rainbow trout, sauger, northern pike, and smallmouth bass are significant to state fishery management objectives and have to be adequately considered. Potential impacts resulting from surface disturbances, aquifer drawdown, and produced-water discharge to these fisheries from conventional and CBNG development need to be addressed through (1) effective and timely communication with Montana Fish, Wildlife and Parks staff; (2) identification of areas as off-limits to drilling because of significant biological, social, or cultural importance; (3) responsible energy development practices to protect our natural resources, particularly fish; and (4) basin-wide planning and analysis of every project.

R-5: The potential for project-related CBNG activities to impact fish and aquatic habitats is contained within the Wildlife, Aquatic Resources section of Chapter 4. Also see R-4.

C-6: The DSEIS does not adequately consider the direct and indirect impacts of either energy development or railroad construction to fish and other aquatic species. For example, the potential of the Tongue and Powder rivers to be recovery areas for pallid sturgeon is high, and restoration is being planned for this federally endangered species through improving fish passage in the rivers. The DEIS and DSEIS provide no information on how energy development or construction of the TRR would affect pallid sturgeon populations or their recovery.

R-6: For direct and indirect impacts, see the TRR EIS (ICC 1992; STB 2004). The SEIS does address the cumulative effects of the TRR and energy development to aquatics. See Chapter 4 under Wildlife, Aquatics Resources for discussion. Measures to protect water quality are described within the water screen under the preferred alternative (Alternative H) as described within Chapter 2.

Long-term effects on pallid sturgeon associated with discontinued activities, such as sediment delivery from roads, would subside as disturbed areas are reclaimed. Agency mitigation measures implemented during abandonment would reduce erosion potential, prevent water pollution, facilitate reclamation of disturbed lands, and further reduce the potential for long-term impacts on pallid sturgeon.

As determined by FWS, implementation of the SEIS, including all of the above conservation measures "may affect but is not likely to adversely affect" pallid sturgeon.

C-7: The SEIS lacks information on fisheries in the development area, including Tongue River Reservoir and the Big Horn River. Specifically, the SEIS lacks information on the current distribution of recreational fisheries for brown as well as rainbow and brook trout, Yellowstone cutthroat trout (YCT); and sauger; northern pike; and smallmouth bass. Information is also lacking regarding the potential impacts to these fisheries from surface disturbances, aquifer drawdown, and produced water discharge from conventional and CBNG development. BLM should eliminate threats by precluding development in sensitive watersheds, or mitigate the losses in the development area. BLM should coordinate with MFWP to develop plans before development occurs to protect fisheries, gather baseline information, monitor effects, mitigate impacts, and enforce regulations.

R-7: The SEIS discusses the potential effects of surface disturbances, aquifer drawdown, and produced water discharge from conventional and CBNG development on aquatic species within the Wildlife, Aquatic Resources section, of Chapter 4. See also R-4.

C-8: Page 3-135 contains the following statement: "Fish sampling in a number of Tongue River tributaries suggests fish in Squirrel Creek have a substantial potential to be affected by CBNG development, primarily from impoundments located within intermittent and ephemeral draws that flow into the creek (BLM 2005d). However, the stream has not been assessed to the extent needed to identify the specific cause(s) of habitat changes between sampling sites located upstream and downstream of CBNG development facilities." It appears, according to this statement, that the DSEIS is using speculation to describe the affected environment. This statement should be deleted from this section and placed in Chapter 4, Environmental Consequences, where this type of speculative analysis is more appropriately located. There is only one CBNG impoundment, for the purpose of analyzing overflow, located within the intermittent and ephemeral draws that flow into Squirrel Creek.

R-8: The statement reflects the observed conditions in Squirrel Creek based on sampling, as referenced by BLM (2005d). The statement provides specific information regarding evidence of potential effects of CBNG development on fish assemblages, but also provides some clarification concerning the potential accuracy of the data interpretation. The referenced statement has been modified in Chapter 3 of the FSEIS as follows: "Fish sampling in a number of Tongue River tributaries suggests fish in Squirrel Creek have a potential to be affected by CBNG development, primarily from impoundments located within intermittent and ephemeral draws that flow into the creek (BLM 2005d)."

C-9: Page 3-136 contains the following statement: "One site in Pumpkin Creek showed a decrease from 10 to four species, with only white suckers occurring both historically and recently." The DSEIS fails to inform the reader that there are no CBNG discharges into Pumpkin Creek in Montana.

R-9: The text within Chapter 3 of the FSEIS has been modified to include the following: "There are currently no CBNG discharges to Pumpkin Creek."

C-10: Page 3-136 contains the following statement: "Another site showing a substantial decrease in species over time was Sarpy Creek. This site showed a decrease from five species historically to one species (fathead minnow) in 2003 and 2005 (MFWP 2006)." The DSEIS fails to inform the reader that there are no CBNG discharges into Sarpy Creek, nor are there any CBNG impoundments within the vicinity of Sarpy Creek.

R-10: The text within Chapter 3 of the FSEIS has been modified to include the following: "There are currently no CBNG discharges to Sarpy Creek."

C-11: There is particular concern about the health of coldwater fisheries in the planning area and the lack of information that the SEIS provides regarding (1) the current distribution of native salmonids and recreational coldwater fisheries; (2) the potential impacts resulting from surface disturbances, groundwater withdrawals, and well discharges to these fisheries from conventional and CBNG development; (3) how BLM will mitigate these impacts or eliminate threats by precluding development in sensitive watersheds; (4) how BLM will coordinate efforts with MFWP to ensure that development plans protect coldwater fisheries before development occurs; and (5) how and whether the federal agency will gather baseline information, monitor effects, mitigate impacts, and enforce regulations to ensure that CBNG development does not impair fisheries. With regard to recreational coldwater fisheries, we are concerned that CBNG development will negatively affect important populations of wild brown, rainbow, and brook trout. It is essential that BLM include a complete inventory of YCT populations using the best available information after consulting with its own biologists, as well as with U.S. Forest Service (USFS) and MFWP fishery professionals. It is suggested that a No Surface Occupancy (NSO) within 0.5-mile of a stream containing genetically pure (99 to 100 percent) native trout stipulation be incorporated into the FSEIS. It is further recommended that this stipulation be expanded to include all conservation populations (90 to 100 percent genetically pure) of YCT. It is also recommended that groundwater withdrawals from aquifers hydrologically connected to streams containing conservation populations of YCT be prohibited. Moreover, we recommend that discharges of produced water also not be approved in watersheds containing conservation populations. BLM has to fully disclose all of the coldwater fisheries that could be affected by CBNG development, not only for the larger rivers in the Planning Area. Also of concern are the popular reservoir fisheries in Tongue River Reservoir, Cooney Reservoir, and Bighorn Lake.

R-11: Information on existing aquatic species within the Planning Area is presented within the Wildlife,

Aquatic Resources section of Chapter 3. The potential for project-related CBNG activities to impact fish and aquatic habitats is contained within the Wildlife, Aquatic Resources section of Chapter 4. The FSEIS has been modified within the Wildlife, Aquatic Resources section of Chapter 3 to include additional information on the occurrence of YCT within the Planning Area. The potential for adverse impacts to individual populations of YCT or restoration efforts will be evaluated during the review process of an operator's POD. Should a proposed development activity have the potential for an adverse effect on the species or individual population, then BLM would implement appropriate measures to provide protection. As stated in the Wildlife Appendix under the heading of Aquatic Species, "Detection of a retraction in the range of a species, a downward trend in abundance, or reduced population diversity in systems with produced water discharge shall warrant a review of Project Plans and possible recommendations for adjustment of management to address the specific problems." This provision would apply to aquatic species in general including those in coldwater fisheries and reservoirs. Also see R-4.

C-12: The use of the 7Q10 tool ensures that poor quality CBNG water is not the majority of stream flow in a system. The text on page 2-19 of the DSEIS allows for modification of this rule based upon monitoring. There is often a delayed response in monitoring aquatic species that may create situations where eliminating the 7Q10 would result when it should not be eliminated. Other impacts, especially drought, would create problems not identified through monitoring.

R-12: The referenced text refers to Alternative F; BLM's Preferred Alternative is Alternative H. Unlike Alternative F, Alternative H would only allow additional produced water discharges from BLM wells so long as water quality criteria are not exceeded. This approach places more emphasis on specific water quality criteria, rather than relying on total discharge limitations to protect aquatic habitat. The monitoring component of Alternative H, combined with adaptive management, would increase the likelihood of obtaining accurate and quantifiable data concerning potential effects of CBNG development on aquatic resources. While there is still uncertainty, including the potential for delayed response, regarding the specific effects of CBNG development on aquatic resources, the use of adaptive management and water quality monitoring are believed to provide an effective means for the protection of this resource. Additionally, use of the 7Q10, combined with monitoring and adaptive management, also considers water volume, as well as water quality. It would, therefore, consider the combined effects that could result from drought conditions. As a result, relatively few impacts on aquatic resources would be expected under Alternative H.

C-13: One of the rationales for the SEIS was a need to further expand on the cumulative impacts of development in the planning area, and more specifically the Powder River Basin. Although some consideration was given for the additional impacts of the TRR for wildlife, the overall cumulative impacts analysis was not conducted. For example, the removal of Intake Dam by the Bureau of Reclamations is as reasonable and foreseeable as the TRR.

R-13: The MDEQ adopts water quality standards to protect beneficial use of surface water. Currently, irrigation use is considered the most sensitive beneficial use. The water quality standards that MDEQ has set to protect irrigation are assumed to also protect aquatic resources. As such, pallid sturgeon should not be impacted by adverse water quality from CBNG-produced water discharges should the fish bypasses at Intake and the Tongue and Yellowstone (T&Y) diversions allow for the pallid sturgeon to increase its range upstream in the Yellowstone or Tongue rivers.

Cultural Resources

Comment 1 (C-1): The DSEIS does not specifically note the presence of the several designated and/or potential National Historic Landmarks (NHLs) within the impact area. The FSEIS should include an evaluation of the impacts to these sites and the measures that will be taken to avoid and minimize impacts to these nationally significant resources. As part of this discussion, BLM must acknowledge the heightened legal standard that applies to the management of NHLs under section 110 of the National Historic Preservation Act (NHPA) and explain how it will satisfy this standard through the development of measures designed to minimize harm to NHLs.

Response 1 (R-1): The existing NHLs have been added to the cultural table in Chapter 3. BLM has requested additional information from the Park Service on the potential NHLs in the SEIS area. The existing listed NHLs, Chief Plenty Coups, Pompey's Pillar Area of Critical Environmental Concern (ACEC), and Pictograph Cave are either in State

Parks (Pictograph Cave, Chief Plenty Coups) or National Monuments/ACEC (Pompey's Pillar) where development is not allowed. Site specific impacts on the listed NHLs would be addressed in the POD plans. If it were found that CBNG development would adversely affect an NHL, BLM would apply the procedures found in 36 CFR 800, rather than using the National Programmatic Agreement (BLM 1997b).

C-2: In the Cultural Resources section of Chapter 4, under the conclusions for all alternatives (pages 4-56 through 4-61), the DSEIS does not advise the reader that on private surface lands, regardless of mineral ownership, title to any cultural resource (excluding grave sites) belongs to the surface owner.

R-2: The FSEIS has text clarifying that on private surface lands, regardless of mineral ownership, title to any cultural resource (excluding grave sites) belongs to the surface owner.

C-3: The SEIS states that there will be no adverse impacts to cultural resources resulting from construction of the TRR. To the contrary, there would most definitely be adverse impacts, beginning with the fact that the railroad is drawn to run directly through the Wolf Mountains Battlefield, a site approved for NHL listing and now pending with the National Park Service (NPS) NHL program in Washington, D.C. In addition, the TRR will run through miles of country that is highly historic. By programmatic agreement, the FEIS deferred section 106 consultation on these impacts to coincide with planning of the railroad segments. There will undoubtedly be impacts; there is no way to build the railroad through the region of the Great Sioux Wars campaign, an NHL, and a rural historic district in the Birney area (recognized in the landscape-level report by RTI for BLM in 2006) without impacting cultural resources. To state otherwise is inaccurate.

R-3: The SEIS incorporates the findings of the Supplement to the TRR EIS. The Transportation Board's section of environmental analysis for its Supplement to the TRR EIS indicated that, with mitigation, neither the construction nor the operation of the TRR would result in significant impacts on cultural resources. Pursuant to the Cultural Resource Programmatic Agreement for the TRR, the landscape level and historic/ traditional cultural property (TCP) district issues would be addressed for any segment proposed for construction that might affect those resources.

C-4: The SEIS states that the planning area includes BLM-administered lands and minerals in the Powder River and Billings RMP areas, but excludes lands administered by other agencies such as the Forest Service, sovereign tribal governments, and Indian allotted lands. While this may represent the land base for which BLM is directly responsible, it then fails to consider the cumulative impacts of BLM-driven development alongside that anticipated on the neighboring Indian reservations, Custer National Forest, and state leased lands. If these areas of development are not included in BLM's cumulative analysis, the leading federal agency for oil and gas development in the region, how will those cumulative regional impacts on the natural and cultural resource base be considered?

R-4: The SEIS includes an analysis of the potential cumulative impacts resulting from future CBNG development on the Northern Cheyenne and Crow Reservations, allotted lands within the reservation boundaries, state lands, and the Ashland District of the U.S. Forest Service. See Chapter 4, Conclusion section.

C-5: Is there no situation wherein BLM would choose not to promote development of mineral resources it administers?

R-5: BLM does have situations where there is no development of mineral resources in certain areas of critical environmental concern (USDI BLM 1999a).

C-6: Why is the landscape cultural level study not mentioned in the SEIS? The commenter notes that the SEIS cites the work of the Montana Preservation Alliance (MPA) in the Tongue River area, which the commenter believes to be misleading, and recommends that it be removed from the document in favor of discussion of BLM's efforts in this area. While MPA's work does further the understanding of resources located within the region, it does not substitute for BLM actively working to meet agency responsibilities under NEPA and section 106 of the NHPA, nor does it alleviate BLM's broader management and planning mandates under section 110 of the National Historic Preservation Act and under the Federal Land Policy and Management Act (FLPMA).

R-6: The Landscape Level Overview for CBNG development areas was used for the SEIS and is referenced within the Cultural and Historical section of Chapter 3.

BLM has included information from many sources, as well as information generated from its own work, in the preparation of the SEIS in an effort to provide the most relevant information to describe the affected area. BLM recognizes that the inclusion of information generated from other sources does not

substitute for meeting its responsibilities under the National Environmental Policy Act (NEPA), NHPA, or FLPMA. Rather, BLM believes that inclusion of information from other sources is a necessary element of meeting these responsibilities.

C-7: Has there been any effort by BLM to conduct landscape level studies within the Billings RMP Management Area?

R-7: The Billings Field Office has not done a landscape level overview such as the one completed by the Miles City Field Office. This was due to limited funding. The Billings Field Office will address landscape level issues when they update their Class I Overview as part of their Resource Management Plan update.

C-8: There are numerous landscapes and spiritual sites of cultural significance to the Northern Cheyenne, Crow, Arapaho, Ute, Shoshone, and several Sioux bands, including Oglala, Santee, Rosebud, Hunkpapa, Lower Brule, and others—some of which are found in BLM's, "An Ethnographic Overview of Southeast Montana." Throughout the Miles City and Billings RMP areas are many more sites of significance to tribes. These sites warrant a separate Indian cultural resource survey to identify the locations of archeological, ethnographic, and traditional cultural properties, "the contexts within which to evaluate their significance," and the prospects for avoiding, minimizing, and/or mitigating any potential impacts to these resources.

R-8: Every proposed POD requires that a cultural survey be conducted by an archeologist (who meets the requirements necessary to hold a BLM permit under Manual 8151) before approval of any surface-disturbing activities. Additionally, consultation with potentially affected tribes is conducted before the approval of each POD to identify TCPs. This has included on-site visits with the Northern Cheyenne.

C-9: For the past two years, research has been conducted on the Birney/Hanging Woman Creek drainages with a cultural landscape orientation. Findings from this work include the following:

- A National-Register-eligible Historic District centered on historic ranching. Several individual listings already on the National Register are located in our study area.
- The potential for an NHL district for dude ranching centered in Sheridan, Wyoming, which historically extended into the Birney rural community.

R-9: As with any culturally significant sites, BLM would consider these in evaluating proposed PODs.

C-10: Table 3-3 is misleading. The reason that only a handful of NRHP sites are listed is not that these are the only ones eligible out of tens of thousands, but that, most of the time, the agency either does not have enough information or chooses not to seek a determination of eligibility on sites it records.

R-10: The NRHP sites listed in Table 3-3 include those officially listed on the NRHP; they do not include sites that are eligible for listing on the NRHP. Table 3-3 also includes the total numbers of cultural resource sites that have been identified by survey for each county.

C-11: Will BLM consider special management designations such as ACECs for split-estate situations where the surface ownership is not federal? Doesn't the Rosebud Battlefield merit the highest sensitivity designation by BLM management? Some formal management consideration seems warranted for this and other highly significant sites to be affected by agency minerals management decisions.

R-11: ACEC consideration can be done on BLM-administered surface only. There are no BLM-administered surface acres in the Rosebud Battlefield.

C-12: On page 2-8, under Cultural Resources, the SEIS prohibits use "within sites or areas designated for conservation uses, public use, or sociocultural use." Montana Fish, Wildlife and Parks requests a list of these areas before any Record of Decision (ROD) is issued for the SEIS. It would be beneficial to both the public and potential/existing lessees, plus it requires that these areas be defined up front. The same comment applies for the Recreation section on page 2-9, these areas have to be delineated before any development.

R-12: There are currently neither concentrated use recreation areas, nor cultural sites designated for conservation, public, or sociocultural use. BLM will coordinate with MFWP in its planning.

C-13: Cultural sites are not only affected by physical alterations of the landscape, but by mineral development that could affect traffic, smells, activity, aesthetics, noise, and solitude. This could alter use of these sites significant to historic and modern cultures.

R-13: The Cultural Resources section of Chapter 4, "Impacts from Management Common to All Alternatives," states that "Noise, activity, traffic, and smells can affect the quality and continued use of Traditional Cultural Properties (TCPs)." This also

applies to other eligible sites under the criteria of effect found in 36 CFR 800.

C-14: The SEIS includes the following statement (page 4-55): "Most of the mitigation of native American cultural resources will entail avoidance, particularly any site associated with burials of human remains." Other state and federally significant sites should also receive these stipulations. Many sites are significant due to 19th century occupation, encampments for the U.S. military, and use by explorers, in addition to Native Americans. They hold social, historical, and cultural significance. Surface owners must be consulted to understand this significance since BLM, state agencies, tribes, and private landowners have yet to conduct scientific or ethnographic studies and document their findings throughout much of the SEIS study area.

R-14: BLM generally stipulates that significant cultural sites are to be avoided when in conflict with oil and gas development, regardless of their ownership. If the site cannot be avoided, there are remedies for preserving the site data; see Chapter 4, Cultural Resources.

C-15: BLM failed to acknowledge that Pompey's Pillar is a National Monument established by presidential proclamation under the Antiquities Act of 1906, 16 U.S.C. §§ 431–33. By failing to recognize Pompey's Pillar as a National Monument in the DSEIS, BLM may make decisions related to CBNG development that are inconsistent with the protection of the objects identified in the proclamation. BLM has to recognize Pompey's Pillar as a National Monument in the FSEIS and discuss its duty to manage Pompey's Pillar to protect the historic and prehistoric objects identified within President Clinton's proclamation. The FSEIS must address how CBNG development will affect the objects, including the landscape surrounding Pompey's Pillar, and explain how BLM will ensure that CBNG development does not adversely affect any of the protected objects.

R-15: The FSEIS has been modified to include the National Monument information in Chapter 3, under "Cultural and Historical." The effects on the monument would be similar to those disclosed on cultural resources in Chapter 4, if development were to occur. However, Pompey's Pillar Monument is withdrawn from mineral entry (oil and gas development is not allowed). The monument boundary lies within the Pompey's Pillar ACEC. Minerals not within the monument and in the ACEC are held in trust for the Crow Tribe.

C-16: On pages 4-55 and 4-56, paragraphs 1 and 2, the Assumptions section within the Cultural Resource section seems to be based strictly on an archeological definition of a cultural resource. That is, it is something that can be quantified, seen with the eye, is a remnant of human activity, and/or is individual in nature that can be moved or transported. Such examples could be burial sites, lithic scatters, or petroglyphs. The Native American perspective of a cultural resource differs greatly from this. It not only includes physical, human-generated, cultural resources, but cultural resources that are seen as a whole landscape, as well. For instance, a specific place that holds great religious value within Native American cultures is considered a cultural resource, even though it may or may not display any evidence of human activity. One example may be a particular field or area within a valley.

R-16: BLM's 8100 Manual defines cultural resources or cultural properties as a definite location of human activity, occupation or use identifiable through field evidence (survey)historical documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, or places with important public and scientific uses, and may include definite locations (sites and places) of traditional cultural or religious importance to specified social and/or cultural groups. BLM manages cultural resources through guidance provided in its 8100 (Cultural Resource) Manual which provides for identification (8110) Protecting Cultural Resources (8140) and Permitting Uses of Cultural Resources (8150).

C-17: Surface owners, other than BLM or Trust Land Management Division (TLMD), should also be given the authority to require a cultural survey before surface-disturbing activities with the results presented as part of the permit review or approval process. If cultural resources are found, the surface owner and State Historic Preservation Office (SHPO) have to approve of the activities and mitigation, if appropriate, before disturbance.

R-17: When federal or state minerals are involved, a cultural resource survey is required, and all findings are shared with SHPO. Consultation with tribes is required for all PODs. Although BLM does not have the authority to require cultural surveys where private surface is involved; BLM does make recommendations to the landowner to avoid any sites on their property.

C-18: The DSEIS states that "BLM would consult with affected tribes when operator's proposed actions are near American Indian traditional cultural

properties, such as the Rosebud Battlefield and the Wolf Mountain Battlefield. Consultation might result in mitigation of impacts to traditional cultural properties." Chief Plenty Coups State Park and Pictograph Cave State Park should also be included on this list. How will BLM determine what is "near"? BLM must also consult with surface owners to determine importance of the site to the state of Montana and the property's social significance, such as a state park or original homestead.

R-18: BLM will consult with tribes for all TCP sites as identified by the tribes. Consultation with SHPO and surface owners will be appropriate when minerals are owned by the federal government, and a site is discovered. It is not appropriate to include Chief Plenty Coups State Park and Pictograph Cave State Park on this list, because there are few or no federal minerals and no potential for CBNG development in or within more than 20 miles of these two parks.

C-19: Individual well APDs (1 per 640 acres) would be accepted and processed without a project POD in accordance with requirements of Onshore Order 1."

One well in a sensitive location combined with the entry roads and pad could pose irreparable damage to cultural sites. How will BLM assure MFWP or the surface owner that cultural sites will be avoided without a POD?

R-19: Cultural surveys are required for all development, whether a POD is required or not.

C-20: Why is there no screen for cultural resources?

R-20: While there is no screen for cultural resources, cultural surveys are required for each proposed POD, as well as tribal consultation to define any TCPs within the proposed development area.

Geology and Minerals

Comment 1 (C-1): BLM did not fully study the combined effects of coal bed methane extraction and the Tongue River Railroad (TRR). This massive project consisting of over 130 miles of railroad track through a ranching valley will have major impacts and must be considered in light of any additional development such as coal bed methane (p. 4-80).

Response 1 (R-1): Cumulative impacts resulting from the construction of the TRR are included throughout Chapter 4 of the SEIS. Additional information on the cumulative impacts resulting from the TRR is in the Minerals Appendix and the Air Quality Appendix.

C-2: BLM needs to state that the Spring Creek Mine is a "dry mine" that does not produce water. This should be addressed under the Geology and Minerals discussion of Alternative H.

R-2: Language has been added to the FSEIS to show that the Spring Creek Mine is a dry mine.

C-3: BLM should advise the reader that the 5-mile buffer around reservation lands will result in a loss of gas resource and tax revenues to the nation, and these losses should be quantified. The Powder River Basin is the third largest gas field with the thirteenth greatest proven reserves in the United States. BLM should also explain that the 5-mile buffer would further add to the loss of private and state gas resources because of the disincentive it provides to developers. BLM should advise the readers that its responsibility to Indian Trust Asset (ITA) lands has a higher statutory priority than its obligation to protect and develop the public domain natural gas resource.

R-3: The analysis and discussions are provided in Chapter 4; Alternatives F, G, and H under the headings "Geology and Minerals" "Social and Economic Values". The 5-mile buffer is not excluded from development; there are, however, additional provisions that must be satisfied for development to proceed. BLM Departmental Manual 303, Chapter 2, defines the Secretary of Interior's Principles for Managing Indian Trust Assets, section DM 303.2.7: Trust Principles. This reads in part, "The proper discharge of the Secretary's trust responsibilities requires that persons who manage Indian trust assets: A. protect and preserve Indian trust assets from loss, damage, unlawful alienation, waste, and depletion…"

C-4: Naturally occurring radioactive materials (NORMs) pose a potential risk to human health and the environment when brought to the surface as a result of coal, oil, or gas development. The DSEIS did not discuss whether these constituents are present in CBNG-produced water from the Powder River Basin in Montana and if they pose a level of risk to the public. The DSEIS did not discuss whether radium is present in CBNG-produced water from the Powder River Basin in Montana and if it poses a level of risk to the public. The Alberta Geological Survey is studying the presence of NORMs in CBNG-produced water; the commenter believes that its findings are relevant to the Montana portion of the Powder River Basin. Radon, a common NORM constituent, may pose a potential risk to human health and the environment when brought to the surface as a result of coal, oil, or gas development. The DSEIS does not discuss whether radon is present in CBNG-

produced water from the Powder River Basin in Montana and if secondary escape via springs and water wells poses a risk to the public.

R-4: NORM, including radium and radon, is a potential byproduct of oil and gas production. It typically accumulates in piping and equipment as scale or sludge and can be present in produced water. It requires appropriate disposal, sometimes including the piping or equipment it has accumulated in once it is removed from service. Because variations frequently occur within and among geologic basins, the findings of the Alberta Geological Survey are not necessarily applicable to the Montana portion of the Powder River Basin. Radon is a volatile gas and readily liberates from the water in which it is dissolved once sufficient pressure is released. The threat to human health posed by radon is most typically the result of exposure in hot water showers, basements, and "tightly" built homes. BLM is not aware of NORM wastes being present in water produced from the PRB.

C-5: Consider withdrawal of mineral leases from all state parks and fishing access sites within the study area, including a 5-mile buffer around those areas, and prohibit surface occupancy and disturbance, including roads. BLM should also consider an alternative that withdraws mineral leases under significant sites that are important to the public socially, culturally, and historically, including traditional cultural properties (for a variety of cultures) and state parks.

R-5: Making oil and gas leasing decisions is beyond the scope of the plan (see Chapter 2, "Alternatives Considered but Not Analyzed in Detail" under "Leasing" for discussion. However, surface occupancy and use is prohibited within sites or areas designated for conservation, public, or sociocultural uses. Surface occupancy and use is also prohibited within developed recreation areas and undeveloped recreation areas receiving concentrated public use; and within 0.25-mile of designated reservoirs and fisheries.

C-6: If lessee surface use rights mature when the SEIS ROD is signed, how can BLM condition the exercise of surface use rights at the APD/POD stage? BLM has to define the relationship of the SEIS relative to the lessees' surface use rights and explain how those rights are managed from the lease stage, through the RMP stage, to the APD/ROD stage. BLM must expressly retain the authority to condition the exercise of surface use rights at the APD/POD stage, or conduct a site-specific NEPA analysis based on the SEIS ROD maturing lessee surface rights.

R-6: Oil and gas mineral lessees do not have a surface use right to their mineral lease. The surface rights are retained by the state and federal governments or the private surface owner. Prior to surface development mineral lessees are required to gain concurrence from surface owners/managers through private surface use agreements or regulations such as Onshore Order #1.

C-7: BLM should abandon its "no-development" approach (e.g., crucial sage-grouse habitat and lands next to Indian reservations) under Alternative H because it could cause further delays in the decision process. BLM has no authority to adjust or "clarify" lease stipulations unless it obtains voluntary agreement from the lessee (43 CFR 3101.1-1 and BLM's Manual 1624). Furthermore, if BLM intends to attach a condition of approval to a permit, it must also be consistent with lease rights. Once a lease has been sold, BLM does not have the authority to prevent development unless the lease terms prohibit surface occupancy, or development would result in unnecessary and undue degradation that could not be mitigated.

R-7: Leases issued by the BLM do not convey full development rights to the lessee. Also, Alternative H does not say "no development" within sage-grouse habitat or on lands near the Indian reservation boundaries. Alternative H requires the BLM and operators that propose development on leases in those areas must conduct more analysis and evaluations against the screens proposed in the alternative. The increase in analysis may cause delays in the decision process, may slow the rate of development and may limit full field development within sage grouse habitat and on lands near the Indian reservation boundaries.

C-8: Many of the mineral leases for CBNG should be reconsidered because these leases were sold without the natural resources data necessary to evaluate whether the impacts from development would significantly negatively affect those other resources. Based on the legal decision, *Northern Plains v. Bureau of Land Management* (CV-O1096-BLG-RWA), the federal oil and gas leases in the Powder River Basin do not yet convey the right to full field development, and BLM has ample authority to reconsider these leasing decisions under that legal decision.

R-8: BLM oil and gas leasing decisions and lease stipulations, including those applicable to CBNG, were previously analyzed in the BLM 1992 Final Oil and Gas RMP/EIS Amendment. Those decisions were approved in the project's ROD published in

February 1994. Analyzing new federal lease decisions, such as closing federal areas of oil and gas estate in the Powder River and Billings RMP areas, are, therefore, beyond the scope of this SEIS.

C-9: It is difficult for the public to obtain documents and notification of pending activities, including leases, when they are offered, projects open for comment, and comment reports. The BLM should have to notify surface owners ahead of time when minerals are being put up for lease, so they can raise valid concerns that could inform agency management and could actually bid on those minerals if the leases were offered for sale. Is BLM doing anything to improve on the current state of communication that forces the public to try to monitor oil and gas activities overseen by BLM offices in both Montana and Wyoming?

R-9: BLM provides public notice when federal minerals are up for lease. BLM provides notice to the public 45 days ahead of all lease sales by posting available lease parcels at the Public Room in the Montana State Office, on the BLM website http://www.blm.gov/mt/st/en/prog/energy/oil_and_gas/leasing.html and at the local office (Miles City Field Office). All applications for permit to drill federal wells are posted in local BLM offices and on the internet for 30 days before approval. During this 30-day period, the APDs undergo NEPA review. The public can comment on the APDs during this time.

C-10: How will BLM modify lease permits already granted with new on-the-ground information on resources that has and will continue to become available? There are areas leased that should not have any development because of the sensitive nature of specific resources. In the development of the alternatives, the DSEIS does not state that BLM will exercise its authority to impose conditions through RMP amendments to add no surface occupancy stipulations to prevent development in areas or surface disturbance to protect important resources.

R-10: Under Alternative H, the BLM will use the screens and thresholds developed to protect resources while evaluating Plans of Development (PODs) and Applications for Permit to Drill (APDs). By using these screens, BLM will apply conditions of approval to the proposals to protect resources identified during BLM's review. The BLM will use adaptive management techniques to adjust to changes in the future.

C-11: Alternative H does not address the effect of landowner surface use agreements, a very important factor for surface and mineral owners.

R-11: The provisions for landowner surface use agreements are contained within the Plan of Development, which is a required element of the Preferred Alternative, Alternative H. Plans of Development are also required under Alternative E, F, and G.

C-12: How is "phased in development" going to be defined if BLM limits the number of permits issued per year? How is permitting going to be addressed?

R-12: The Preferred Alternative, Alternative H, does not set numeric limits on the pace of development, but uses the four identified resource screens to control and monitor development to mitigate or reduce potential impacts. Numeric limits on the number of APDs BLM would approve annually and within specified watersheds are elements of Alternatives F and G. Under Alternatives F and G, numeric limits may affect the timing of how some developments proceed.

C-13: It is imperative that the producer/operator post enough bonding capacity to cover any mitigation, including revocation for non-performance or poor performance.

R-13: Bonding is discussed within Chapter 2 under "Alternatives Considered but Not Analyzed in Detail, Bonding."

C-14: BLM is avoiding its federal trust responsibility for Indian Trust Assets by putting the mitigation decisions onto the operators.

R-14: BLM would require operators to demonstrate how their proposal, with mitigation incorporated, would not impact Trust Assets. It then is BLM's responsibility to assess the proposal and make the determination if Trust Assets are protected or require additional measures to provide this assurance. The application of the four screens, increased planning and monitoring for development within the 5-mile buffer zone, and tribal consultation assist in the protection of ITAs as well as TCPs.

C-15: Alternative "H" places a higher value on the protection of tribal assets than development of public domain natural gas resources.

R-15: It is BLM's responsibility to assess proposals and make the determination that Indian Trust Assets are protected or require additional measures to provide this assurance. Development isn't necessarily precluded (see Response R-14 above).

C-16: Tables 4-3 and 4-4 provide the number of APDs to be issued under BLM's assumed rates of development for Alternatives F and G, respectively. The private/state rates are based on the reasonably

foreseeable development (RFD) scenario, while the BLM rate results from application of its four "screens." This section indicates BLM would issue no APDs in years 3, 4, and 5 of Alternatives F and G, with peak APD approvals in years 11 and 12. Neither of these alternatives, in particular Alternative F, appears reasonable since without concurrent approval of federal APDs it is highly unlikely that CBNG producers could expand into new adjoining POD areas. They would also be unable to advance into new private/state leases that lie beyond lease blocks dominated by federal ownership.

R-16: The information provided in Tables 4-3 and 4-4 is for assumed development rates for Alternatives F and G, respectively. Under Alternatives F and G, BLM would not issue any federal APDs if state and private APDs exceeded the annual limits under these alternatives. In Tables 4-3 and 4-4 this is assumed to occur in years 3 and 4. If state and private APDs did not meet or exceed the annual limits set under Alternatives F and G, then BLM could still issue APDs. If state and private APDs met or exceeded the annual limits set under Alternatives F and G, whether in year 3 or 4 or any year of development, however, then BLM would not issue any federal APDs. Annual limits set under Alternatives F and G could affect the timing of some developments on federal leases if the annual limit on APDs were met or exceeded by state and private APDs. Alternatives F and G also include limits on the number of APDs that would be approved each year by watershed. This provision could also affect the timing of some developments on federal leases if the annual watershed limit were met or exceeded by state and private APDs.

C-17: The Montana Board of Oil and Gas Conservation (MBOGC) has the authority to control CBNG development on state and private lands, and operators on federal land must seek permits from MBOGC. MBOGC is a cooperating agency on this DSEIS. MBOGC thus has ample authority to guide development on state and private lands to implement a phased alternative. Therefore, the fact that "BLM authorizes BLM wells only" does not preclude the agency from working with the state of Montana to implement a phased development alternative that develops one watershed or specific area at a time.

R-17: BLM is working with the State of Montana, but no commitment has been made by the State to develop one watershed, or specific area at a time. BLM has considered geographic phasing by setting numeric limits on the number of APDs that would be approved annually within each watershed in the development area under Alternatives F and G. By setting federal numeric limits on the number of APDs approved annually per watershed, development within certain watersheds would be delayed pending approval of the number of APDs that would be economically viable.

Hydrological Resources

Comment 1 (C-1): The SEIS states that the discharge of CBNG-produced water would be in accordance with rules and regulations of state or federal agencies. What rules and regulations are being referred to?

Response-1 (R-1): A discussion of the regulations and agencies responsible for regulating wastewater discharges is included in Chapter 1.

C-2: Is reinjection of CBNG-produced water considered in the SEIS? BLM dismissed the alternative of reinjecting CBNG wastewater into the aquifer as a produced water management tool; this is a practice in other states. Although reinjection is a logical solution to pursue, BLM simply fails to consider it as a possible mitigation measure for one of the biggest impacts of CBNG extraction (p. 2-4).

As an example of best available control technology (BACT) that we believe is not adequately addressed, BLM quotes (on page 2-4) a 2005 report that states that injection into the Fort Union Formation in the Powder River Basin has not been widely tested, and areas where favorable conditions exist appear to be limited to 9 percent of the area. However, there is no additional information provided, such as potential storage capacity or location of these areas. The Montana Bureau of Mines and Geology continues to study this issue, and these conclusions will likely change. We do not believe that BLM should dismiss reinjection.

R-2: The text within the SEIS states that reinjection may be feasible in 9 percent of the planning area. Reinjection must be technically and economically feasible. Injection into the Madison Group strata is discouraged, because it would essentially result in removal of that water source for future use within the Powder River Basin. Reinjection, as a method of produced water management, is discussed under Hydrological Resources Alternatives B, F, and H.

BLM has not dismissed the option of injection as a CBNG-produced water management option and provides information on the various types of injection options that could be used within the Hydrological Resources section of Chapter 3. Reinjection of produced water into the same aquifer is discussed under the heading of "Reinjection of Produced Water

into the Same Aquifer Alternative" within Chapter 2. Alternative B provides a detailed analysis of the injection of produced water into units other than the coal seams (see Chapter 4 for analysis).

C-3: What elements does the SEIS include to protect water, one of Montana's most valuable resources?

R-3: The Montana Department of Natural Resources and Conservation (DNRC) issued an order that describes the authorities that pertain to CBNG development and groundwater: "Final Order: In the Matter of the Designation of the Powder River Basin Controlled Groundwater Area." The order is included in the SEIS via reference to Appendix E of the Water Resources Technical Report (ALL 2001b). The order requires groundwater monitoring and reporting and indicates that water mitigation agreements must be offered to owners of water wells or natural springs within the area that may be impacted by CBNG development. Water management plans must be submitted by CBNG operators before approval to drill can be obtained. If a surface discharge is requested, the CBNG operator must obtain a Montana Pollution Discharge Elimination System Permit, which must protect all beneficial uses. In addition, BLM's Preferred Alternative, Alternative H, includes a water screen to further protect surface water quality (see Chapter 2 under Alternative H.)

C-4: When proposing water mitigation within 1 mile on private property versus 5 miles around Indian reservations, the 5-mile area is more prudent. Data from around Decker and Wyoming show significant drawdowns (20 percent of more) 2 miles out.

R-4: Pursuant to MCA 82-11-175, if appropriated groundwater within 1 mile of the coal bed methane well may be impacted by a CBNG production operation, then the mitigation area will be automatically extended 0.5 mile beyond the water well or natural spring adversely affected. The owners of water rights are also protected from impacts from CBNG through the Coal Bed Methane Protection Act (MCA 76-15-9). The Act provides for the establishment of a fund that can be used to compensate landowners and water rights holders for damages attributable to coal bed methane development. Also, MBOGC Order 99-99 states that water mitigation agreements must be offered to any water right holder who is in the area of impact. Therefore the 1-mile distance should be viewed as a minimum distance.

The 5-mile buffer around the reservations is to help protect Indian Trust Assets and resources of concern to the Tribes. This buffer delineates an area where additional analysis is needed when CBNG projects are proposed, while the 1-mile buffer delineates an area in which a water mitigation agreement must be offered. The difference in buffer distances is largely a function of the buffer's purpose.

C-5: The development of CBNG should allow for unlined, on-channel reservoirs for the storage of produced water. The use of unlined, on-channel reservoirs should be combined with an intelligent groundwater monitoring program.

R-5: The use of unlined, on-channel reservoirs is allowed under the preferred alternative (see discussion in Chapter 2, Alternative H, Produced Water Management). Any on-channel CBNG impoundments would have to be approved by MDEQ, and MDEQ would develop the groundwater monitoring requirements. The MBOGC would have to concur with MDEQ from a water management perspective. The BLM would also have to concur with the MDEQ for impoundments that received water from federal wells, or were located on federal surface.

C-6: BLM did not consider whether water mitigation agreements effectively protect landowners. To measure the effectiveness of these agreements, BLM only interviewed industry representatives; they did not consider the perspectives of landowners (pages 2-6, 3-45 through 3-48).

Aquifer drawdowns are projected to occur 20 miles or more from CBNG development, yet water-well mitigation agreements are still required only for wells within 1 mile of a producing CBNG well. Other problems with these agreements still are not addressed. BLM cannot continue to rely on these agreements without an analysis of their efficacy and assessment of other possible mitigation that could be implemented to make up for their shortcomings.

R-6: BLM had to determine whether water mitigation agreements actually mitigated effects. As every agreement can be different, BLM interviewed industry representatives to determine how many water mitigation agreements had been executed and what mitigation measures were used to address the potential impacts from CBNG production to area water wells. How effectively the landowner is protected in the agreement depends on the agreement the landowner made with the company.

The protective measures provided for in using water mitigation agreements are discussed under the heading of "Management Common to All Alternatives" within Chapter 2. Should a well within 1 mile of a producing CBNG well be impacted, then

the cone of influence for the agreement is extended out another 0.5 mile and so on until no more wells are impacted. Groundwater drawdown, how it relates to water mitigation agreements and possible mitigation measures are discussed under the heading of "CBNG Groundwater Drawdown and Water Mitigation Agreements" within the Hydrological Resources section of Chapter 4.

C-7: If a water supply well goes dry as a result of nearby CBNG activity, the operator must replace that lost water supply. However, the mitigation agreement does not state how the lost water must be replaced. Thus, the CBNG company could haul water to the damaged party and keep a cistern filled, or could drill a new well. If the latter, the new well will be in a different aquifer, causing the water right holder to lose his/her senior water rights; he/she now has a junior water right to the CBNG company that destroyed his/her water source. And, this new, deeper well will require more electricity to operate in perpetuity. This after-the-fact mitigation is simply inadequate given the severity of impact on senior water right holders and the severity and longevity of the impacts on naturally flowing springs and artesian wells.

R-7: The form of the replaced water will depend on the area and the agreement between the landowner and the CBNG operator. If an existing well fails and a new well is constructed to replace it, a replacement well water right may be issued by DNRC, which would retain the priority date of the old well. This information has been added to Chapter 4, Hydrological Resources, CBNG Groundwater Drawdown and Water Mitigation Agreements subsection of the FSEIS.

If the replaced water consists of a deeper well with higher operating costs, then it is up to the operator to negotiate compensation for the higher operating costs with the CBNG operator. If cost negotiations with the operator are not successful, the landowner can petition for compensation under the Coal Bed Methane Protection Act (MCA 76-15-9).

C-8: The DSEIS ignores the consequences of CBNG wastewater discharges on downstream irrigation, because (on page 4-125) BLM assumes wastewater will be treated before being discharged. However, no wastewater treatment requirements have been established in Montana, in part, because the CBNG industry has fought every effort made to establish standards and because both the CBNG industry and the state of Montana are arguing against establishing treatment requirements in the MPDES lawsuit *Northern Cheyenne et al. v. DEQ et al.*, DV 06-34 Big Horn County. BLM has to examine the positions being advanced in that lawsuit, because there will be no wastewater treatment required if DEQ prevails.

R-8: While treatment is not specifically required at this time, the Montana Board of Environmental Quality has designated EC and SAR as harmful parameters. The designation of these parameters as "harmful" causes non-degradation criteria to apply. As such, CBNG water would have to be treated to ambient, or better, water quality since all streams in the Montana portion of the Powder River Basin currently exceed 40 percent of the established standards.

The potential effects to surface water quantity and quality are detailed in the Hydrological Resources section of Chapter 4 and the Surface Water Quality Analysis Technical Report (SWQATR). BLM recognizes the transitional nature of current water quality standards and CBNG rules in Montana. Implementation of the provisions of the Water Screen (i.e., 10 percent of the 7Q10) provides an additional level of assurance for protecting surface water quality.

C-9: The SEIS has to address the Northern Cheyenne Tribe proposed regulations for dealing with coal bed methane development that are pending before EPA. The tribe also has nondegradation criteria with different standards. Why is there no discussion of the Northern Cheyenne non-degradation criterion?

R-9: The adoption of surface water quality standards by the Northern Cheyenne Tribe is discussed in the Hydrology section of Chapter 3 and in the Hydrological Resources section of Chapter 4. The Northern Cheyenne water quality standards are mentioned, but not in detail, because they have not been approved by EPA.

C-10: Aquifer drawdown has not yet been truly examined.

R-10: The drawdown of groundwater within aquifers is discussed in the Hydrologic Resources section of Chapter 3, under the heading "Observed CBNG Related Groundwater Drawdown," and in the Hydrological Resources section of Chapter 4 under the heading, "CBNG Groundwater Drawdown and Water Mitigation Agreements." Additional information is also contained in the Water Resources Technical Report (ALL 2001b), the groundwater modeling reports (Wheaton and Metesh 2001; Wheaton and Metesh 2002), and the subsequent groundwater monitoring reports (MBMG Open File Reports 508, 528, 538, and 556).

C-11: If BLM were to implement phased development under Alternatives F, G, or H, as indicated on Page 4-4, it could result in longer time frames for a given amount of CBNG development. Application of general groundwater theory suggests that a given amount of CBNG development, which is more spread out in time and space, will result in a greater total quantity of produced water due to the additional recharge to the coal beds over the longer period of production. The time period for recovery of pressure head in the produced coal beds would also be extended. The SEIS should make it clear that this is one of the tradeoffs of phased development.

R-11: CBNG production will continue until the wells no longer produce natural gas in economic quantities. Thus each individual well is not producing for a longer period of time. While the amount of water produced per well may be somewhat increased if CBNG development is spread out in space (due to there being more "edge"), this difference is unlikely to be substantially different than that assumed for the SEIS.

C-12: Page 4-101 discusses the mixing ability of the Yellowstone River and concludes that CBNG water will have no impacts on the Yellowstone River waters. No attempt was made to quantify the site-specific impacts to Tongue River irrigators, T&Y, Kinsey, Buffalo Rapids Project and the other major private irrigators along the Yellowstone River downstream of the confluences which bear CBNG water. This opinion is not currently shared by the Buffalo Rapids Irrigation Company. The irrigation company's proposed solution to its perceived water quality problem will have habitat impacts that are unacceptable to MFWP fisheries managers. Buffalo Rapids Irrigation Company is proposing drastic habitat alterations to the stream course of the Yellowstone River to reduce the detrimental effect of CBNG discharge water on its crops. The Buffalo Rapids Company has asked state regulatory agencies about building deflection barriers in the Yellowstone River downstream of the confluence of the Powder River. The District purports that saline water from CBNG production in the upper Powder River is not diluting in the low flow period of the summer months. This water is then flowing along the south bank of the Yellowstone River, a distance about 2 miles downstream, where it enters one of the district's water intakes and is fed into the irrigation system to irrigate crops. The district's theory is that building jetty-like berms into the river would make it easier to mix and dilute the saline water coming from the Powder River with higher quality water from the Yellowstone River before it is used in the irrigation system. The proposed berms would create fish movement and navigation problems during these low flow periods and are discouraged by MFWP fisheries staff. Furthermore, there is no definitive proof that these measures would increase the quality of water pumped into district intakes during these low flow periods.

There is no account of what the SAR/EC relationships are just downstream of the Tongue and Powder rivers. The Powder River water does not mix until well past Terry, close to Fallon, and it hugs the south bank. This causes an acute problem for the Terry irrigators as SARs above 3 have been seen with ECs below 800. A soils analysis of Buffalo Rapids' soils and what effect varying CBNG water compositions might have on them indicated that a SAR of 3 with a corresponding EC of 800 spelled trouble for heavy soils (51 percent of BRP soils). At that point danger exists that a cumulative effect could take place over years, permanently damaging the heavy soils and rendering them useless for crop production. There is no way to know how far downstream these effects may carry before adequate mixing occurs.

R-12: The referenced text refers to potential effects to the Yellowstone River resulting from CBNG-produced water discharges under Alternative C, which was not selected as the Preferred Alternative. Further, the text does not indicate that CBNG water will have no impacts on the Yellowstone River waters. Rather the text states, "The surface water quality of the Yellowstone River would be noticeably degraded by discharges from Montana and Wyoming under Alternative C; however, beneficial uses would not be impacted."

MDEQ has set numerical standards for SAR and EC that it believes are protective of soils, plants, and animals. The analysis conducted for the Tongue River at Brandenburg Bridge (USGS Station 06307830) and for the Yellowstone River near Sidney (USGS Station 06329500) are believed to be representative of the water quality that will be experienced by irrigators near Miles City and on the Yellowstone below the Powder River. Impacts at Kinsey would be lower than those calculated for the Sidney Station, since the intake is upstream from the Powder River. If it is anticipated that irrigation water is going to come primarily from the Powder River, the calculations for the Powder River at Locate should be representative (USGS Station 06326500).

C-13: The SEIS states that the water from the shallow Dietz seam near the Tongue River Reservoir is recharged from the Tongue River Reservoir. Now

that the aquifer pressure has been lowered, more water comes from the reservoir. This is water that belongs to the Tongue River water users and the Northern Cheyenne Tribe. How will the water users or the tribe be compensated for this taking of water?

R-13: The SEIS considers this issue in Chapter 3, Hydrology, under "Observed CBNG related Groundwater Drawdown." The SEIS suggests that a small volume (approximately 1.5 gallons per minute [gpm]) of water is being drawn into the shallow Dietz coal aquifer. BLM has a responsibility to protect Indian Trust Assets, which includes groundwater.

C-14: I obtained water quality data from the United States Geological Survey for the gauging station at Miles City for 1959 to the present. I used the period from 1959 to 1972 as a baseline because no discharges from coal mining or CBNG were present at that time. I then averaged the water quality data from 1999 to the present and compared it to baseline data. The sodium adsorption ratio increased by 44 percent from the baseline data.

When will the screening guidelines kick in? Do 10 percent of the irrigators have to be damaged before anything is done? Do 50 percent of the irrigators have to be damaged? I do not see that there is a screening guideline for soil damages in this SEIS.

R-14: An increase in SAR, or any other single indicator, cannot be assigned to a single source without modeling flow and composition in the stream. As described in the SEIS, flow rate and composition are closely related in Montana's rivers. The samples mentioned for CBNG development lie entirely in a period with extended drought. As stream levels drop, salts increase, and calculated indicators such as SAR also frequently increase. As discussed in Chapter 2, the water screen will kick in if untreated CBNG discharges to a stream exceed 10 percent of the 7Q10.

Screening guidelines under the Preferred Alternative, Alternative H, would not be implemented until the ROD is approved and signed. A screen for damages to soils from the use of CBNG-produced water was not deemed necessary. Water quality standards are set to protect irrigation. Should a landowner decide to use CBNG-produced water directly for irrigation, it is up to the landowner to determine if the water is useable, given site-specific soil properties, the type of crop to be irrigated, and the application rate and overall volume of water used.

C-15: The cumulative effects on water quality are not considered. The Tongue River Railroad final EIS was submitted last fall. It states that 20,000 tons of sediment will be introduced to the Tongue River during construction. It also states that 7,000 to 10,000 tons of sediment will be dumped into the Tongue River every year after that. If standards at Miles City are being exceeded now, things will only get worse with the TRR. The cursory review of effects from TRR is not adequate.

R-15: The potential for sedimentation impacts to the Tongue River from the TRR is discussed within the Hydrological Resources section of Chapter 4. Construction of the TRR would be consistent with all state and federal rules and regulations, and hydrological impacts are expected to be short-lived and minor. Construction of the TRR will increase the local effects of soil erosion with a greater suspended sediment load to the Tongue River and its tributaries. The use of mitigating measures and best management practices is expected to minimize erosion and control runoff. These impacts are anticipated to be of low intensity and short duration. Sediment yields will return to natural levels once vegetation is reestablished.

C-16: BLM failed to include and recognize its only requirement, as contained in Onshore Oil & Gas Order Nos. 1 and 7, is for federal acceptance of water management plans, so long as mitigation agreements meet all applicable laws of the state.

R-16: The SEIS points out repeatedly that the requirement for water mitigation agreements is a state issue administered by the DNRC and MBOGC. BLM must have reasonable assurance that water mitigation agreements have been offered prior to approving federal APDs; however BLM believes that including an example Water Well Mitigation Agreement provides a better explanation of how these agreements would work as opposed to a bulleted or check list of those items required by state law. The terms of actual agreements will be as determined by operators and the water source owners.

C-17: What methodology, frequency, and discharge rate will be used to determine "projected to exceed"? How would the 7Q10 be derived for ephemeral streams that do not flow most of the year? What will be the obligation for MDEQ to complete the report in a timely manner? What is the scope of the report? How frequently would the report have to be redone if new data or proposed sites come to light? If another operator proposes discharges in the same area how will the report include those sites? Would not it be more efficient for the operator to prepare the report following BLM specified requirements and methods and use MDEQ to review? Will the operator have

opportunity to review, comment, or rebuff parts of the report and findings?

As BLM recognizes in the water screen, MDEQ has the lead role in managing Montana water resources and administers the MPDES permit program for all CBNG discharges. Under criteria for determining nonsignificant changes in water quality (Administrative Rules of Montana [ARM] 30-7:17.30.715), the existing surface water quality resulting from activities that would increase the 7Q10 flow by less than 10 percent is defined as nonsignificant and does not require additional review under 75-5-303, MCA. Therefore BLM's screen and proposal to prepare a surface water monitoring report only serve to complicate the regulatory framework and burden the MDEQ with further collaboration. Please clarify how the water screen is different from the review required under 75-5-303 MCA, and if any additional mitigation measures would be required above and beyond what can be expected from MDEQ.

R-17: The water screen is not a limit on discharge. It is a trigger to be used by BLM to indicate when detailed analysis of monitoring data is needed. This would allow BLM to evaluate the potential for water quality standards being exceeded before the exceedance actually occurs.

Discharge monitoring reports will be used to determine the volume of untreated water being discharged. The 7Q10 calculations will be based on USGS streamflow data. Ephemeral and intermittent streams will have a 7Q10 of zero, so analysis will be required if there is any untreated discharge.

BLM has entered into a memorandum of understanding (MOU) with MDEQ under which BLM is providing funding under the Energy Policy Act's Pilot Office provisions for several MDEQ positions. One of the duties specifically identified for these positions is the review of BLM analysis.

The scope of the report is discussed in Chapter 2 of the SEIS, under Alternative H. This section has also been modified to clarify that this would be an annual report, which considerers all discharges within the watershed cumulatively.

BLM does not believe that it would be more efficient to have operators prepare the reports, since this would require preparation effort and then detailed review and analysis of many reports. In most cases, these reports will probably not be complicated or controversial; in cases where it appears that there are issues, however, stakeholders may be consulted.

The provisions of the water screen are not substantially different from MDEQ requirements under 17.30.715. Both items relate to the 10 percent over the 7Q10 threshold and both allow re-evaluation under "cumulative impacts" and "any other information deemed relevant by the department."

C-18: The SEIS does not analyze the indirect impacts to wildlife or the human environment from discharge of produced water to surface streams. This may impact shoreline vegetation and increase soil salts to the extent that both sensitive crops and native vegetation may be killed. In addition, there may be impacts to shallow groundwater quality from impoundment infiltration and other water management practices.

R-18: The SEIS does analyze the direct and indirect potential impacts to wildlife and the human environment. They are addressed in several sections of Chapter 4, including Hydrological Resources and Wildlife.

C-19: There is no evidence of water quality degradation at the Montana border attributable to CBNG discharges. This fact should be highlighted and stated directly in the EIS. Any reference to assertions that the way WYDEQ is managing water quality discharges will lead to degradation of surface water quality below standards in Montana is unwarranted, unsupported by the facts, and should be removed from the document.

R-19: The SEIS states that the impact analysis is based on the assumption that water management in Wyoming will proceed as assumed under the Wyoming EISs (USDI 2003) Alternative 2A (see the "General Assumptions" section in Chapter 4. It is also discussed in the impacts section that implementation in Wyoming may be different than assumed to assure compliance with the Montana Standards (e.g. see Chapter 4 "Hydrologic Resources" Alternative E under "Powder River".

C-20: Page 2-8: Under "Hydrologic Resources" the wording in the second paragraph should be changed to the following: "Montana's water quality standards for the Tongue and Powder Rivers are being challenged by court actions which are not yet resolved. The states of Montana and Wyoming are in negotiations on appropriate state line standards and how CBNG discharges in Wyoming will be managed to meet whatever standards are eventually adopted."

R-20: The wording within the FSEIS Mitigation Measures Common to All Alternatives table has been modified accordingly.

C-21: Page 4-77: In the second paragraph of the right-hand column, note that Montana's 2003 standards are being challenged in both Montana and federal courts and that those court actions have not been resolved. Additionally, the last sentence should be modified as follows: "In addition, all CWA permits issued in Wyoming authorizing discharges into streams that flow north into Montana contain conditions to ensure that Montana's water quality standards are not exceeded at the border."

R-21: The language in the FSEIS has been modified.

C-22: Pages 4-77 and 4-78: Montana's proposed nondegradation requirements have not been approved by EPA. Their impact, even if approved by EPA is very speculative at this time. Wyoming suggests that the discussion of this issue be limited to those basic facts and that the discussion on page 4-78 as written be deleted.

R-22: The text within the SEIS acknowledges that the standards have not been approved by EPA. However, BLM believes that the discussion concerning the effect of possible outcomes is necessary to understand the issue.

C-23: Page 4-84, Table 4-33: The table should include the timeframe of the data set used to establish the existing stream water quality and the data source (i.e., USGS). The table should include the assumptions used in making the calculations, such as assumed additional flow from CBNG water; assumed EC, sodium, calcium, magnesium and any other constituent concentrations used in the calculations; the method of calculating resulting concentrations; and the timeframe represented (i.e., yearly average, seasonal average, or monthly average). This comment is applicable to all other tables representing mixing calculations throughout the document.

R-23: The data set used is in Chapter 3, Hydrological Resources, Surface Water Discharge and Water Quality for Minimum Mean Monthly Flows at Selected USGS Stations Table. The stream segments and gauging stations are shown on the Powder River Basin Watersheds and Area USGS Gauging Stations Map. The assumptions used concerning water quantity and quality is contained in the text.

C-24: Page 4-84: This section discusses Alternative A, No Action (Existing CBNG Management) and assumes that approximately 15 percent of the water produced in Wyoming would reach the Tongue River, but there is no basis for this assumption. In fact, WYDEQ records and records from the Wyoming Oil and Gas Conservation Commission substantiate that no more than 1.1 percent of produced water in the Tongue River Drainage Basin has actually reached the Tongue River in any given month. That equates to a peak average monthly volume of 0.19 cubic feet per second. Consequently, the effects presented in Table 4-33 should be amended to incorporate realistic expectations of CBNG flows and concentrations.

R-24: The assumption is 15 percent of the produced water in the Wyoming portion of the Tongue River watershed discharged to impoundments would reach the Tongue River. This is based not only on existing production but also on future production under the Reasonably Foreseeable Development Scenario. This value was derived during the development of the Surface Water Quality Analysis Technical Report in 2002. The development of this analysis included input from WYDEQ, MDEQ, EPA, and BLM. Using 15 percent as an estimate is a reasonable approach to assessing potential affects from the discharges in Wyoming. The text within the FSEIS clarifies that the 15 percent refers to produced water within the Tongue River watershed that is discharged into impoundments.

C-25: The first paragraph under Powder River on page 4-85 and first paragraph on page 4-86 under Little Powder River incorrectly suggest that Wyoming discharge permits do not protect the Montana water quality standards. Wyoming CBNG discharges are managed to result in minimal to no change in water quality in rivers shared between Montana and Wyoming. In all circumstances, they are managed not to exceed Montana water quality standards. The management of CBNG in Wyoming should not be in question in this document. The 40 percent minimum mean monthly flow is not relevant to the document because it is not an existing enforceable standard and should be deleted.

R-25: The referenced language states that under Alternative A, there would not be any CBNG wells in Montana discharging to the Powder or Little Powder rivers. Therefore, any alteration in quantity or quality of water in the two rivers would be due to discharges in Wyoming. This does not suggest that Wyoming discharge permits do not protect Montana Water quality standards.

C-26: The DSEIS does not describe what an application must contain to demonstrate that surface or subsurface water will not be degraded. The DSEIS must set forth how Onshore Order No. 7 will be applied in this instance to be consistent with previous applications in other locations and for other oil and gas operations.

R-26: What an application must contain is determined on a case-by-case basis depending on several factors, including the water quality and soil type (it is site specific). Demonstrating that water will not be degraded will depend on site-specific conditions.

C-27: The term "land application" should be replaced with "managed irrigation" to maintain consistency throughout the document. "Land application" as the term is generally used is not considered to be a beneficial use.

R-27: The text in the FSEIS has been modified to read "managed irrigation" as opposed to "land application."

C-28: Regarding increased methane production in two water wells on the Tongue River Reservoir State Park, as well increased seepage under the reservoir, the DSEIS only refers to the MFWP in this discussion. Have operators been approached about this issue? What data are available, and how does MFWP know that there is increased seepage under the reservoir? The DSEIS does not explain the fact that there is an outcropping of coals within the reservoir.

R-28: The information as presented was reported to BLM by MFWP and concerns only reports of methane. Potential causes are not discussed.

C-29: SAR is not a constituent; it is the ratio of calcium and magnesium in comparison to sodium. The DSEIS does not provide a complete list and map showing the USGS monitoring stations along the Tongue River.

R-29: SAR is defined as a ratio within the text of the Hydrological Resources section of Chapter 3. A list of USGS monitoring stations is in Chapter 3, Hydrological Resources, Surface Water Discharge and Water Quality for Minimum Mean Monthly Flows at Selected USGS Stations Table. A map also shows the location of USGS monitoring stations included as Powder River Basin Watersheds and Area USGS Gauging Stations Map.

C-30: There is a statement in the SEIS, "As such it does not appear that CBNG development had a measurable effect on EC and SAR through 2005." Has this knowledge and the relevant data been considered and applied in the development of the new alternatives? If so, how and in which alternatives?

R-30: Surface water quality and quantity data were considered in the development of each alternative. The more recent data for 2003 through 2005 was also considered in the development of Alternatives F, G, and H. The potential for impacts to surface water quality and quantity are not based solely on current levels of development, but also on future development as outlined in the Reasonably Foreseeable Development Scenario described in Chapter 4.

C-31: There are no electrical power plants using CBNG-produced water within the DSEIS area. They are not applicable to the current affected environment.

R-31: It is appropriate for Chapter 3, Affected Environment, to include a discussion of the potential beneficial uses for CBNG-produced water.

C-32: The DSEIS fails to address the naturally occurring groundwater quality present in the wells on the reservation. Table 3-19 demonstrates an extremely wide range of SAR and total dissolved solids (TDS) values, with the upper ends of the ranges higher than most CBNG-produced water; e.g., in the table, highs for SAR range from 11 to 82, and, TDS ranges from 1,180 to 8,060 mg/l.

R-32: The data in the Chapter 3, Native American Concerns, Groundwater Sodium Adsorption Ratio and Total Dissolved Solids Values Crow Reservation Table are based on the analysis of naturally occurring groundwater present in wells on the reservation. The source of the data is referenced in the table.

C-33: How will BLM (and the Northern Cheyenne Tribe) enforce very low allowable SAR and TDS numbers in CBNG-produced water when natural sources have high numbers and wide ranges?

R-33: MDEQ, EPA, and the Northern Cheyenne Tribe are responsible for enforcement of water quality standards.

C-34: The DSEIS should advise the reader that MDEQ has never granted an authorization to degrade water quality. Consequently, it should not be presented as a viable option for any alternative.

R-34: The fact that MDEQ has never approved an authorization to degrade water quality is acknowledged within the DSEIS (for example see Chapter 4, Hydrological Resources, Alternative C, Rosebud Creek and Yellowstone River Subsections, etc.). Although it has not been done yet, an authorization to degrade is still a legal option (MCA 75-5-303.3).

C-35: On page 3-50 under "Existing Wells and Springs," the DSEIS states the following: "Furthermore, it is unlikely that CBNG production would impact springs, because if subsurface coal

seams were in direct contact with surface springs, water and methane gas would have long ago leaked to the surface....” Most springs are expressions of local groundwater flow systems. BLM should make its discussion on page 4-81 consistent with its interpretation in Chapter 3.

R-35: The text in Chapter 3 provides that it is unlikely that CBNG production would impact springs. The text in Chapter 4 provides management alternatives that could be used should a spring be impacted, however unlikely that may be. The text from Chapters 3 and 4 is consistent.

C-36: Nonproductive coals are predicted to regain 80 percent of their pressure within five years. Surface aquifers that are projected to lose only 6 feet of pressure, would regain 50 percent of that pressure in less than 10 years (Wheaton and Metesh 2002, page 4-82). BLM should modify this statement because no drawdown effects from CBNG production have been observed in non-producing aquifers or overlying aquifers after 6 years of monitoring in the CX Field (Source: Ground Water Information Center database 2006).

R-36: The statement accurately reflects the groundwater modeling results and is not based on the current level of production from the CX Ranch Field. The fact that drawdown has not been observed in units other than the developed coal seams is included in Chapter 3, Hydrological Resources, Observed CBNG Related Groundwater Drawdown Subsection.

C-37: A recent analysis of WYDEQ's Impoundment Groundwater Monitoring Database found that of 77 CBNG impoundments in compliance monitoring; only 6 came out of compliance due to exceeding one or more water quality parameters. By the end of 2006, those six sites were back in compliance following subsequent monitoring (Osborne, et al. 2007). BLM should advise the reader of these updated findings.

R-37: BLM reviewed this information in the preparation of the FSEIS. The review determined that, when compared to the DSEIS, new significant information was not presented. Therefore, the new information did not result in a modification to the FSEIS.

C-38: Water well or spring mitigation agreements are private contracts between operators and willing landowners. Operators cannot be required to certify that agreements have been made when some landowners may not be willing to sign one. Jurisdiction over mitigation agreements is under the Montana DNRC, not BLM. Thus, requiring that an operator certify entering into such an agreement is unreasonable and unwarranted.

R-38: Alternative E does require the operator to certify that mitigation agreements have been ratified; however, this requirement has been dropped from the proposed decision (see Chapter 2, Alternative H).

C-39: The DSEIS should note that the cause of the siltation in Hanging Woman Creek is not related to CBNG production and that this impairment is best addressed by correcting the sources of the impairment through the total maximum daily load (TMDL) program by the appropriate agencies and landowners. It is not within BLM's statutory authority to limit treated water discharges.

R-39: The identified probable source of impairment is included in Chapter 3, Hydrological Resources, Impaired Water Bodies in Area of Maximum CBNG Potential Table of the SEIS. The fact that the stream is impaired may be used by MDEQ to determine the level of discharge of treated and untreated water that would be allowed. Additionally, since BLM is the designated management agency for water quality for lands it manages (2002 Non-point source MOU between BLM and DEQ), the agency must evaluate potential impacts to surface water quality from erosion/siltation.

C-40: MDEQ, not BLM has the responsibility to issue discharge permits that meet applicable water quality standards and non-degradation criteria under the Clean Water Act (CWA). BLM attempts to impose water quality criteria which are duplicative of the state of Montana's criteria, are mandated without any formal rule-making process, do not acknowledge whether an operator is compliant with its MPDES permit, and would be applied without consideration of site-specific conditions. Furthermore, BLM has not defined land health standards, nor invoked an authoritative reference. The proposed 7Q10 limitation exceeds BLM's authority and could create more environmental impacts, while interfering with POD area-wide water management, which will be permitted by MDEQ to meet all applicable water quality rules.

The "potential to cause water quality standards to be exceeded" is not defined. How is potential defined in terms of concentrations, for which parameters, and at what flow rates? The DSEIS has not indicated if and how BLM would account for the natural variations in water quality in determining potential. The DSEIS has not indicated if and how BLM would account for contributions of contaminants from non-CBNG sources, such as mining or irrigation return flows, in determining potential. The DSEIS has not indicated

what regional surface water monitoring stations it is referring to, nor if and how it will deal with potential discharge sites that do not have upstream and/or downstream regional monitoring stations.

R-40: BLM's intent with the water screen and implementation of the 10 percent of the 7Q10 threshold is to provide a way to evaluate the potential for a discharge to exceed a water quality standard before the exceedance actually occurs. This would allow BLM, in consultation with MDEQ, to work with operators in implementing measures to avoid the exceedance.

The first paragraph describing the screen (see Chapter 2, Alternatives, Alternative H, Water Screen Subsection) clearly identifies the objective as coordination and reducing duplication of efforts. Natural variations and non-CBNG sources would be considered during consultation with MDEQ.

BLM recognizes the primacy of MDEQ in permitting and enforcement of water quality in the state but retains its oversight responsibility as it applies to management of produced water from federal minerals. The water screen does not have specific limits attached to it, as each hydrological setting and CBNG development is site-specific. CBNG water, although it is unaltered groundwater, is considered to be a pollutant. As such, it is regulated by the MDEQ's MPDES program.

Land health standards refer to the Montana/Dakotas Standards for Rangeland Health, operating standards developed to guide management of all uses on BLM rangelands managed by the Miles City Field Office.

Potential to exceed is determined by surface mixing models included in Chapter 4 Hydrology. Regional monitoring guidance is spelled out in the USGS Surface-Water Monitoring in Watersheds of the Powder River Basin, 2005 report in the Monitoring Appendix.

C-41: New Tables HYD-2 and HYD-3 present the 2004 TMDL impaired water body status for the Upper Tongue River and Lower Tongue River, respectively. These stream segments have experienced discharge of treated and untreated CBNG-produced water. However, CBNG was not found to be a source of water quality impairment by MDEQ. The impairment sources included grazing, agriculture, wastewater lagoons, dam construction, and flow modification or hydromodification. Flow modification and hydromodifications are associated with stream diversions for irrigation. Given this new information, BLM should update the 2003 discussion on page HYD-3 under the heading "Surface Water Impact from Discharge." The initial statement, "[i]mpacts to surface water from discharge of CBNG water can be severe depending upon the quality of the CBNG water," is also not consistent with the TMDL findings. The cited TMDL report demonstrates that the other referenced sources have resulted in impaired water bodies in the Tongue River drainage, but that CBNG activities to date have not.

R-41: Findings of the 2004 Impaired Waterbodies List are included in Chapter 3, Hydrological Resources, Impaired Water Bodies in Area of Maximum CBNG Potential Table of the SEIS. This table includes the probable sources of impairment. Neither CBNG nor oil and gas development is mentioned as a probable source. While CBNG activities have not impaired water bodies in the Tongue River drainage to date, the potential does exist, particularly as development expands beyond current levels.

C-42: HYD-8: "The 1996 list identified many waters within the Tongue and Powder TMDL planning areas as impaired by salinity, total dissolved solids, chlorides, metals, inorganics, suspended solids, siltation, nutrients, low dissolved oxygen, pathogens, flow alteration, thermal modification, and habitat alteration. Of these pollutants, salinity, total dissolved solids, metals, and nutrients are frequently associated with produced water from CBNG development. CBNG development may also cause flow alterations and associated pollutants to exceed standards (i.e., total suspended solids)."

This paragraph does not accurately reflect the sources of water quality impairment actually found in the 2004 TMDL assessment. It should be updated to more accurately reflect that sources other than CBNG discharges are responsible for the current impairments in the Tongue River Basin. BLM's updated discussion should clarify that the pollutants listed, including salinity, total dissolved solids, and nutrients are also frequently associated with agricultural sources of contamination and that irrigated agriculture in the Tongue River Basin is a large source of flow alterations.

R-42: The tables contained within the Hydrology Appendix contain information on the "Probable Causes of Impairment." The text in the FSEIS states "agriculture, dam construction and hydromodification (all of which relate to irrigated crop production), are included on these lists."

C-43: The DSEIS should set forth that the monitoring requirements for CBNG discharges are contained in an operator's MPDES permit, which is administered and enforced by MDEQ. It should also

state that BLM will rely on MDEQ to implement monitoring requirements and trigger levels and to require remedial action as necessary.

R-43: BLM has the responsibility to monitor the disposition of water and other products taken from federal minerals. While it does not approve and administer MPDES permits, it retains an advisory role to MDEQ as these permits pertain to federal minerals. Onshore Order Number 7 clearly states the following: "The approval of the Environmental Protection Agency or a State/Tribe shall not be considered as granting approval to dispose of produced water from leased Federal or Indian lands until and unless BLM approval is obtained."

C-44: There is significant new information regarding the feasibility of reinjection that further establishes its viability as a means of protecting ground and surface water resources. MBOGC recently granted a permit to Pinnacle Resources to reinject CBNG wastewater, and the Montana Bureau of Mines and Geology has produced maps of underground formations suitable for injection. The SEIS must incorporate these and other developments in taking a hard look at a phased development alternative that incorporates reinjection.

R-44: Injection is already considered and analyzed as a water management option under the preferred alternative; however it cannot be mandated in all areas. When injecting into coal seams, the area must be geologically or geographically separated from CBNG development. As discussed in the SEIS, studies indicate that suitable shallow injection zones in units other than the coals, which would allow for the future use of the water, are limited to about 9 percent of the PRB.

C-45: The water screen is unsupported by science or data. Because the screen is applied on a watershed basis, it would not provide protection to the countless ephemeral streams. As with the wildlife screen, the 10 percent of the 7Q10 limit appears to be pulled out of a hat. We can find no scientific basis for requiring a surface water monitoring report only if discharges within the watershed are projected to exceed 10 percent of the 7Q10.

R-45: The use of 10 percent of the 7Q10 limit is based on MDEQ's non-degradation regulations. BLM's intent with the water screen and implementation of the 10 percent of the 7Q10 threshold was to provide a way the agency could evaluate the potential for a discharge to exceed a water quality standard before the exceedance actually occurred. This would allow BLM, in consultation with MDEQ, to work with the operator(s) in implementing measures to avoid the exceedance. Because the water screen is applied on a watershed basis, it would apply to ephemeral as well as main stem streams (i.e., any untreated discharge to an ephemeral or intermittent stream would trigger the requirement since the 7Q10 is zero).

C-47: BLM's proposed use of the 7Q10 flow rate as a water screen is a mistaken policy. Evidently BLM assumes that all discharge permits issued by MDEQ would be based on the annual 7Q10. Although some permits include discharge limits incorporating the annual 7Q10 flow, not all permits do, and other flow criteria may be used. The Montana Board of Environmental Review specifically eliminated a provision in state rules that had previously required use of the 7Q10 flow for CBNG permitting. (httD:/Iwww.dea.state.mt.uSldirl/egallNotices/17 - 236adD.pdf).

R-47: The provisions of the water screen are in addition to MPDES permit conditions. In accordance with BLM's responsibilities that apply to federal minerals, they will advise MDEQ about surface water quality changes and CBNG production

The screens are not a regulatory step, but rather a tool to identify potential problems. MDEQ is responsible for making all determinations of water quality impairment. Until such a determination is made, BLM may prohibit disposal of any substance on public lands.

The text within the SEIS does not imply that BLM is regulating water quality. In fact, it clearly discloses who has regulatory authority. Outside of this regulatory arena, BLM has a responsibility to know the condition of public resources and what effects are being generated by activities it approved. This would allow BLM to coordinate with the proper agency that does have regulatory authority. This regulatory body could then take appropriate regulatory action while BLM takes appropriate management action (actions necessary to meet BLM's standards for rangeland health, Miles City Standard 5). In this case, MDEQ would be responsible for regulatory action, and BLM would be responsible for its land health (management) standard.

C-48: On page 2-21, it is specified that even if the 10 percent of 7Q10 threshold is not exceeded, CBNG discharges could be arbitrarily disallowed from federal wells. The first full paragraph on page 2-21 appears to authorize this in ill-defined situations where CBNG discharges are causing surface water quality standards or land health standards to be exceeded, but not by enough to exceed the actual standard stated in the SEIS.

R-48: The text is correct. If CBNG discharges are causing surface water quality standards to be exceeded (i.e., excessive erosion), even if discharges do not exceed the 10 percent of the 7Q10 threshold, no additional CBNG discharges would be allowed from federal wells upstream of the exceedance.

Land Health Standards refer to the Montana/Dakotas Standards for Rangeland Health, operating standards developed to guide management of all uses on BLM rangelands managed by the Miles City Field Office. Excessive erosion is covered under these standards.

C-49: EPA recommends that the water screen clearly state that the CWA and EPA's implementing regulations require that discharges with the potential to cause or contribute to water quality standards (WQS) excursions be subject to water-quality-based effluent limitations as stringent as necessary to meet water quality standards.

R-49: The water screen is in addition to MDEQ permits, including MPDES requirements for water quality based effluent limitations. See the modified text in Chapter 1 of the FSEIS under the heading of Montana Department of Environmental Quality.

C-50: There is a concern that applications for individual well permits will not require preparation and submittal of a plan of development, which includes a water management plan. Information provided in the DSEIS indicates that CBNG wells produce water at a rate of 15 to 20 gpm, which, over time, is reduced to 2 to 5 gpm (page 3-52). With the substantial quantities of water produced by even an individual CBNG well, EPA recommends that BLM require water management plans for individual CBNG APDs.

R-50: While not submitted as part of a POD, water management for individual well APDs must conform to Onshore Order 1 (Approval of Operations) and Onshore Order 7 (Water Management). Part of Onshore Order 7 is a demonstration of the ability to safely manage produced water.

C-51: In the DSEIS, the impacts to surface water quality were estimated using EC and SAR values for CBNG-produced water quality based on data available through 2002. Considering the extensive CBNG development that has occurred since 2002, EPA recommends that BLM review the CBNG water quality estimates used in the impact analysis to ensure that they are still representative and not significantly under-predicting or over-predicting the impact to surface water quality.

R-51: Comparisons of monitoring data to modeling data indicate that the model used for the SEIS is somewhat conservative. While there have been much more data collected about CBNG water quality in the basin, most is from Wyoming or that part of Montana directly adjacent to Wyoming. Large portions of the Montana part of the basin have had no CBNG production. In some respects, the coal sequence is getting shallower, and higher quality water may occur, as seen in the eastern edge of the basin in Wyoming. The general trend up to now is that water quality declines as production moves north and west in the basin. In the next 20 years, these outlying areas are expected to become productive, but water production rates and water quality are likely to vary highly. Parameters used in the SEIS are considered to be conservative, but reasonable, estimates.

C-52: EPA is concerned about concluding that CBNG development will not affect surface water quality because additional discharges of saline CBNG-produced water will likely increase total dissolved solid (TDS) loading to receiving streams. Also, increased stream flows from CBNG discharges beyond historical flows have the potential to destabilize stream channels and increase channel and bank erosion, thus, potentially increasing sediment and siltation impairments. EPA recommends that BLM clarify this text in Chapter 3.

R-52: Chapter 3 does not conclude that CBNG development will not affect surface water quality. It concludes that monitoring to date has not resulted in noticeable impacts. This is not to say that future development at RFD levels could not result in noticeable impacts. The SEIS highlights the impacts of CBNG development on surface water quality in the Hydrology section of Chapter 4, which includes a quantitative analysis of impacts to EC (proportional to TDS) and SAR. A qualitative description of the impacts from increased flows, sediment, and siltation is also included in Chapter 4. Uncertainty of impacts was one of the reasons behind the proposed water screen and the subsequent adoption of a two-part discharge monitoring program with built-in redundancy. To discharge treated, partly treated, or untreated water, an operator must first obtain an MPDES permit from MDEQ. The permit will set limits on discharge in terms of TDS loading, SAR effects, and flow rate impacts. Permits are written with knowledge of and reference to existing stream conditions and existing discharge permits. The water screen functions as an additional way to alert the oversight authority of BLM on federal minerals.

C-53: It is unclear from the discussion in Chapter 4 of the DSEIS whether the Yellowstone River would receive both untreated and/or treated discharges.

R-53: The Yellowstone River at Sidney, Montana (the gauging station downstream of all Montana and Wyoming CBNG development), will receive both treated and untreated water. The text in the FSEIS in Chapter 4, "Hydrological Resources" and then "Yellowstone River" has been modified to read as follows: "…from the Wyoming portion of the Powder River Basin under the Preferred Alternative. CBNG discharges to these streams will be a combination of treated and untreated water."

C-54: Up to 18,225 new CBNG wells could potentiality be developed on federal surface and mineral estate lands, including some with additional saline discharges to surface waters. BLM predicts that water quality will be "slightly altered; however, beneficial uses will not be diminished," due to the proposed CBNG development (page 4-77). EPA is concerned about even slight alterations in water quality, since monitoring data show that water quality standards are currently exceeded at times in some surface waters (Table 3-7, page 3-37, Table 4-54, page 4-113), and water bodies in the area are listed as water quality impaired under section 303(d) of the CWA (Table 3-9, page 3-39). Where existing water quality is already at or near the water quality standards, even small reductions in water quality may cause or contribute to water quality impairments.

R-54: The potential for impacts to surface water quality resulting from project related activities is discussed in detail under the Hydrological Resources section of Chapter 4. The potential impacts are based on the specific elements for each alternative, which could include up to 18,225 Applications for Permit to Drill being approved for CBNG wells.

As stated in the SEIS (see Chapter 4 Hydrological Resources), many streams exceed Montana's water quality standards. CBNG has the potential for impacting surface water, but the MPDES permitting process and the water screen process are designed to mitigate the impacts. Page 1-10 has been modified to clarify that discharges with the potential to cause or contribute to water quality standard excursions are subject to water quality-based effluent limitations as stringent as necessary to meet water quality standards.

C-55: Throughout the development of the EIS and subsequent SEIS, numerous stakeholders have expressed concern regarding CBNG water management and impacts. Thus, it is important that the SEIS clearly identify the water bodies that may be impacted and the potential impacts. EPA recommends this section be expanded in the SEIS to include more detailed maps and to clarify impacts predicted under the Preferred Alternative, Alternative H.

R-55: More detail can be found in the SWQATR and the 2003 EIS, which are part of the SEIS. These are the best estimates of impacts from a regional perspective. Detailed site-specific analysis will be conducted for each proposed federal POD per NEPA requirements.

C-56: EPA recommends that Table 3-9 (page 3-39), Impaired Water Bodies In Area Of Maximum CBNG Potential be expanded to include all CWA section 303(d) listed water bodies in the area that could potentiality be affected by CBNG development (e.g., Otter Creek, Pumpkin Creek, Powder River, Little Powder River, Mizpah Creek, Stump Creek). Table 3-9 should be revised to disclose all water quality impaired streams in the project area that could potentially be affected by CBNG development.

R-56: All section 303(d) impaired streams from the 2004 report that may be affected are listed in Chapter 3, Hydrological Resources - Impaired Water Bodies in Area of Maximum CBNG Potential Table. The referenced streams are not listed as impaired on the 2004 303(d) list. The 303(d) list is defined as waters with Category 5 designations: i.e., "Waters where one or more applicable beneficial uses have been assessed as being impaired or threatened, and a TMDL is required to address the factors causing the impairment or threat." (MDEQ 2004).

C-57: EPA recommends that sufficient monitoring be conducted in all receiving streams where there are CBNG discharges to surface waters to ensure that such discharges are not causing or contributing to excursions of water quality standards, rather than only in those watersheds where proposed untreated discharges exceed 10 percent of the 7Q10 flow.

R-57: MPDES permits contain monitoring requirements. In addition, the Miles City Field Office has published annual watershed monitoring reports describing water quality trends in the main streams. The water screen contains provisions for additional monitoring of stream water quality. This level of monitoring is believed to be adequate, based on results of the monitoring data collected to date for streams in the basin.

C-58: The DSEIS discusses the extent to which Montana's water quality standards would apply to Wyoming. We suggest that BLM review the current draft language to ensure the document clearly and consistently explains that regulated discharges in

Wyoming must ensure compliance with Montana's water quality standards at the border.

R-58: This requirement has not been clarified. See the discussion within the Hydrological Resources section of Chapter 4.

C-59: EPA recommends that the SEIS evaluate and discuss potential water quality impacts associated with other potential pollutants in CBNG discharges, especially selenium and fluoride.

R-59: The Water Resources Technical Report (ALL 2001b), which the SEIS incorporates by reference, includes data on selenium and fluoride, as well as many other constituents from the water produced from the CX field on page 36, Exhibit 24. Selenium and fluoride have not been seen as a widespread problem in CBNG water in the PRB; however they may be of concern as site-specific parameters. As such, they will be addressed in the site-specific water management plans and discharge permits, rather than in this basin-wide document.

C-60: EPA recommends groundwater modeling and monitoring be required for CBNG development within 11 miles of reservation boundaries at a minimum. EPA believes that the commitments in the water screen could be strengthened to provide a way to detect all potential aquifer drawdown that may occur from CBNG developments, including those that result from CBNG developments that are over 5 miles from reservation boundaries.

R-60: Aquifer drawdown that would occur beyond the 5-mile reservation boundaries is taken into account (see response to C-4). In addition to the water screen, the water well and springs mitigation agreements, as required under Order 99-99, would provide a way to monitor groundwater drawdown around private water wells and tribal land.

C-61: The DSEIS indicates that production plans will be modified to limit drawdown impacts to springs that are culturally significant or critical to wildlife. If the springs have been identified, EPA recommends that the SEIS include a map identifying the springs. If the springs have not been identified, EPA recommends that the SEIS include a discussion of how the springs will be identified and monitored and how mitigation measures will be considered to reduce impacts from drawdown.

R-61: As detailed in Chapter 2, POD Requirements, CBNG developers must identify water wells and springs in the vicinity of proposed development during POD submission. Monitoring springs will be part of any development plan. Springs that are culturally significant would be identified through consultations with tribal authorities on a site-specific basis for each POD submitted to BLM. Springs that are important to wildlife would be identified through the site-specific wildlife survey conducted for each POD.

C-62: Exceedance of Northern Cheyenne Tribal Water Quality Standards should be included among the factors for remedial action triggers (Table Mon-1). The remedial action trigger for groundwater drawdown is a 20-foot decrease in static water level. It appears that this would allow for a significant groundwater drawdown before the remedial action of a water well mitigation agreement is offered to landowners. EPA recommends that a lower magnitude of groundwater drawdown (e.g., 5 feet) be considered for a remedial action trigger. It is not clear why the remedial action trigger of a 50 percent decrease in spring discharge is only determined in the first three years. If groundwater drawdowns that cause significant reduction in spring flows occur after three years, EPA recommends these adverse effects to springs should also be mitigated.

R-62: Receiving stream monitoring is part of every MPDES permit issued by MDEQ regardless of the rate of discharge. MDEQ determines which parameters would be monitored for surface water discharges on a site-specific basis depending on the quality of the discharged water and the receiving water body. Where appropriate, and if approved by EPA, the Northern Cheyenne Water Quality Standards would be included in monitoring requirements. BLM believes that a 20-foot drawdown in static water level is appropriate for determining potential impacts to groundwater, particularly since it is dealing with aquifers having substantial artesian pressure. Requirements for water mitigation agreements are specified by MBOGC Order 99-99, and are not a function of the trigger in the monitoring appendix. The seasonally adjusted mean spring flow is determined in the first 3 years; this is the spring's baseline flow rate against which subsequent flows are measured to determine impact.

C-63: Adequate resources are often not devoted to monitoring of environmental effects so that effects may go undetected. Thus, they are not adequately mitigated. EPA recommends that BLM discuss this issue in the SEIS and ensure adequate resources for monitoring. EPA also recommends that BLM ensure that agencies and the public to have access to periodic monitoring reports and information on mitigation taken in response to monitoring results.

R-63: Monitoring of surface water quality is specified by MDEQ and written into MPDES

permits. Groundwater monitoring is required by MBOGC as part of each development plan. Monitoring reports submitted to the MBOGC are posted on its website. Data collected in association with MPDES permits are available through EPA's STORET database. The Montana BLM has established a CBNG monitoring website where all monitoring reports are posted (http://www.blm.gov/mt/st/en/fo/miles_city_field_office/cbng/monitoring.html).

C-64: For the benefit of the public, when discussing the regulatory areas where BLM has shared responsibilities or consultation requirements with other federal agencies in Chapter 1, page 1-6, EPA suggests the following edits to the second bullet: " For activities that would impact waters of the United States from the discharge of produced water, BLM must comply with the Clean Water Act (CWA) as provided by section 313 (which subjects the federal government to the same requirements regarding the control and abatement of water pollution as any nongovernmental entity relating to the discharge or runoff of pollutants) and section 401 of the CWA, (which gives states the authority to veto or place conditions on federally permitted activities that may result in water pollution)."

R-64: The existing text clearly states BLM's responsibility to comply with the Clean Water Act and the Montana Water Quality Act.

C-65: EPA also suggests the SEIS include language in Chapter 1, page 1-12, to explain the link between water quality standards, permits, monitoring and assessment. EPA suggests adding the following text to the end of the CWA section 303(c) paragraph on page 1-12: "NPDES permits must include limits as stringent as necessary to meet water quality standards (40 CFR 122.44). When waters are monitored and assessed, the data are compared to the water quality standards to determine whether the water is impaired and whether discharges have the reasonable potential to cause or contribute to such impairments."

R-65: The text in the FSEIS has been modified to include the recommended language.

C-70: In Chapter 3, page 3-32, EPA suggests adding a reference in the fourth paragraph of the Surface Water section to Vol. II, HYD-10 to -11 and adding language to HYD-10 to clarify that the standards language there is the 2003 language, not the 2006 language. EPA also suggests BLM add the following clarification to the end of the first paragraph on page 3-36: "The numerical standards for EC and SAR shown in Table 3-6 are the same under Montana's 2003 and 2006 standards."

R-70: The text in the FSEIS has been modified to include the recommended language and changes.

C-71: In Chapter 3, page 3-32, EPA also suggests adding the following sentence to the end of the paragraph about EC and SAR: "Although EPA has no recommended 304(a) criteria for SAR and EC, states may choose to adopt criteria for SAR and EC to protect agricultural crops."

R-71: The text in the FSEIS has been modified to include the recommended language.

C-72: In Chapter 3, page 3-36, the SAR and EC concentrations corresponding to the minimum mean monthly flows at each station were estimated from flow versus concentration relationships developed for each station based on USGS data through 2002. This cutoff date is appropriate for most rivers in the Powder River Basin, but may not be appropriate for the Tongue River and downstream of the Tongue River at Stateline Station. CBNG-produced water has been directly discharged to the Tongue River upstream of the Tongue River at Stateline Station since 1997. The flow versus concentrations relationships for the Tongue River should be reviewed to ensure that those used in the SWQATR for the impact analysis are appropriate for the time period before CBNG discharge to the river.

R-72: Numerous studies have been made of the pre-CBNG and post-CBNG water quality in the Tongue River, and no noticeable increases have been observed for these parameters after the onset of direct discharge of CBNG-produced water to the Tongue River.

C-73: In Chapter 3, page 3-52, Water Management, EPA recommends the text under the third bullet be revised from "injection into deep non-underground sources of drinking water..." to "injection into deep underground non-drinking water sources," for clarity.

R-73: The text in the FSEIS has been modified to include the recommended language.

C-74: In Chapter 4, page 4-88, Table 4-37, please clarify the EC values for the Bighorn River at Bighorn. The Table lists the EC values as 962, but the SWQATR lists the values as 952.

R-74: The SWQATR is correct. The EC value of the Bighorn River at Bighorn in Chapter 4, Hydrological Resources, Effects on Surface Waters of the little Bighorn and Bighorn Rivers under the Alternative A Table has been corrected in the FSEIS.

C-75: In the Surface Water Quality Analysis Technical Report, the hydrologic resources sections refer repeatedly to the SWQATR, but do not provide

a valid reference to the report. The Bibliography lists this report as written by Greystone Environmental Consultants, November 2002. However, the final report was published in January 2003 and lists both Greystone and ALL Consultants as the authors.

R-75: Text of the bibliography for the FSEIS has been changed to the following: USDI Bureau of Land Management, 2003. SWQATR: Surface Water Quality Analysis Technical Report, report to accompany Final Montana Statewide CBNG EIS, Greystone Environmental Consultants and ALL Consultants, Jan 2003.

C-76: Existing approved water management operations may require alteration or even complete changeover to a new method to meet new, more restrictive, standards based on monitoring. Provide a clarification of how BLM intends to phase in new water management measures so that production can continue at a reasonable level. Also provide time criteria that will be allotted to implement new water management measures.

R-76: The Preferred Alternative (H) allows for changing water management requirements. If requirements change, different proposed water management practices will be evaluated on a site specific basis.

C-77: Within the water screen discussion on page 2-21, the word "untreated" should be inserted in the following sentence: "If CBNG discharges are causing surface water quality standards, or land health standards (i.e., excessive erosion), to be exceeded, even if discharges do not exceed the 10 percent of 7Q10 threshold, no additional untreated CBNG discharges would be allowed from federal wells upstream of the exceedance."

R-77: Existing language emphasizes that either treated or untreated water discharges can impact water quality and stream conditions. Even additional treated water discharges can cause increases in suspended sediments and modification to the riparian zone.

C-78: BLM indicated that in addition to following court orders, the agency decided to include an analysis of certain changes in conditions that occurred since the previous ROD was signed. However, additional changes which have to be addressed are itemized below:

- The rate of development is much slower than projected in the 2003 FEIS.
- Water from CBNG wells is significantly less than projected in the 2003 FEIS.
- Groundwater monitoring data show significantly less extensive drawdown than expected in the 2003 FEIS.
- Montana has adopted new stringent water quality standards in the Powder River Basin.
- Additional monitoring activities addressing surface water quality, soils, and crops in the Tongue River watershed have been initiated (USGS Tongue River monitoring, an additional gauging station directly above the T&Y 12-mile diversion dam on the Tongue River.
- The MDEQ Tongue, Powder and Rosebud Creek TMDL Modeling Committee has been established.
- The Agronomic Monitoring and Protection Plan program and Tongue River Information Program have been established.

R-78: The comments provided address current conditions relative to CBNG production at current levels, and most of these points have been incorporated into the SEIS (see Chapter 3, Hydrological Resources). The SEIS also has to consider the potential for those conditions to change as a result of increased CBNG production as proposed within the Reasonably Foreseeable Development Scenario, particularly as development spreads to areas away from the CX Field development.

C-79: Inclusion of the 7Q10 flow rate in the water screen is inappropriate because it presumes all discharge permits issued by the respective state departments of environmental quality would be based on the annual 7Q10 flow. Many permits do not fall within these parameters. In fact, the Montana Board of Environmental Review specifically eliminated a provision in the state rules which had previously required use of the 7Q10 flow for CBNG permitting. The SEIS fails to identify criteria for determining when water quality standards are exceeded. The term "potential" is undefined and fails to explain how natural variations in water quality would be addressed. Moreover, it fails to discuss contaminants from non-CBNG sources or how BLM would handle potential discharge sites not covered by regional monitoring stations.

R-79: The water screen is a BLM reporting trigger, and is not directly linked to any particular permit. Use of 10 percent of the 7Q10 flow is a valid threshold for evaluating if the potential exists for exceeding a water quality standard.

C-80: The paragraph discussing observed infiltration effects on page 3-49 describes what happens to water stored in ponds. It shows that the SAR of the water decreases as it infiltrates, and the EC of the water increases. Photos of ponds near the Decker Coal mine show that the seepage water goes down, hits an impermeable layer, and then proceeds down-gradient. The photos reveal that the water comes out of that seam and then seeps into the mine. The same phenomena will occur with CBNG ponds, but they do not empty into the mine. The water from them will proceed down-gradient until it hits the Tongue River. The seepage water has a TDS of 3,548 and a SAR of 14. How will this water affect water quality in the Tongue River? How long does it take to progress underground to the Tongue River? This management option of water should be discontinued as it only postpones the load of salt from getting into the river. It could very well postpone it until after the developers are gone. The cost of cleanup will then be the responsibility of the state or the landowner.

R-80: Storage of CBNG water in surface impoundments is one option for water management. Many studies are underway in both the Wyoming and Montana portions of the Powder River Basin. While some subsurface migration has occurred, many impoundments appear to be appropriate vehicles for managing waste water. The potential for using impoundments to manage produced water would depend on site-specific conditions. If unacceptable impacts would occur, such as poor quality water seepage into the Tongue River, the proposed impoundment would not be approved.

C-81: Will plugged wells be reopened once the development is complete? Will any water be put back into the aquifers to replace the water that has been removed? What good is the water right for this well if the developer is allowed to take all of the usable water from it?

R-81: Mitigation agreements must be offered to potentially affected landowners; whether or not they execute the agreements is up to the landowners. If the well is impacted, it is often plugged to avoid venting of natural gas. The water supply is then replaced by the operator. After abandonment of the CBNG field, the water wells could be returned to use after a period of recharge so long as they were shut-in rather than plugged.

C-82: On page 4-78, the SEIS talks about the newly adopted non-degradation policy. This non-degradation policy has recently been challenged by the state of Montana, which has sued the state of Wyoming (in the U.S. Supreme Court) for violation of the Yellowstone River Compact. This case has relevance for issues in this DSEIS because the outcome of this suit will determine how the issues of CBNG wastewater, water mitigation agreements, and other water-related issues are addressed for water coming into Montana from Wyoming. The DSEIS does not consider this issue. The comment is made that non-degradation will be assumed in Montana but not in Wyoming. How can water quality be maintained at ambient levels in Montana if Wyoming does not comply?

R-82: The SEIS addresses Wyoming development and the potential affects that development could have on surface water quality in Montana. The SEIS does not claim that ambient water quality will be preserved in all watersheds. In addition, Wyoming has a pollutions discharge elimination system permitting process to protect water quality.

C-83: On page 4-81 of the SEIS, there is a discussion about a hydraulic barrier, and injection wells could be used for such a purpose. This highlights the fact that water can be injected into the aquifers being developed. Why wasn't reinjection into the same aquifer considered in this document for phased in development? Couldn't this also serve to protect wells of adjacent landowners that are not developing? BLM discussed the CX field at the hearing and stated that some of operators' wells are shut in on the edge of their fields. BLM also stated that those wells have come back to about 80 percent of their original levels in about one year. The recharge is coming from the aquifer horizontally. This means that the aquifer is being drawn down for people who obtain their water from that aquifer. Why hasn't reinjection been practiced when the wells were shut in to serve as a hydrologic barrier? It would help alleviate some of the problems caused by CBNG discharge water.

R-83: Reinjection of produced water into the same Aquifer is discussed in Chapter 2, "Alternatives Considered But Not Analyzed in Detail," under the heading, "Reinjection of Produced Water into the Same Aquifer Alternative." The use of reinjection wells to create a hydraulic barrier is presented as an example of one way to limit the lateral extent of drawdown.

C-84: On page 4-82 of the SEIS, there is a statement that the water would likely take hundreds of years to recharge through infiltration. How will landowners be able to sustain their operations if the aquifers do not come back for as long as the SEIS estimates?

R-84: The SEIS (Chapter 4 Hydrological Resources, CBNG Groundwater Drawdown and Water Mitigation Agreements subsection) states that

"...within three to four years water levels in the coal aquifers are expected to partially recover to within 20 to 30 feet of pre-operational conditions. Complete water level recovery will be a long-term process, likely requiring hundreds of years...." In these artesian aquifers, it is believed that 20 feet of drawdown is a reasonable parameter for evaluation of impacts. Water wells that are impacted by CBNG development would also be covered by the requirement for water mitigation agreements.

C-85: On page 4-84 of the EIS, there is a table that shows water quality at the gauging stations on the Tongue River. Why has the Miles City Station been omitted? The Miles City Station is one that has been monitored for a long time. I acquired the grab sample data from USGS for the Miles City Station, and I arrived at baseline water quality for the Miles City Station for 1959 until 1972. At this point in time, the T&Y ditch was in existence for over 50 years. The return flows from irrigation from T&Y irrigation would be included in these averages. The EC average was 826 microsiemens per centimeter, and the SAR average was 1.48. The next time period I averaged was from 1973 to 1998. The Decker Mine began discharging coal water into the Tongue River in 1973. The EC average was 808 microsiemens per centimeter, and the SAR average was 1.55. In 1999, CBNG discharges started into the Tongue River. From 1999 to 2006, the EC average was 904 microsiemens per centimeter, and the SAR was 2.13. Using the 1959 to 1972 data as baseline, the SAR has increased by 44 percent. The EC has only increased by about 9 percent. This is an unacceptable increase in SAR. This decrease in water quality can only be attributed to CBNG. If the change were due to drought, the EC would have changed by 44 percent to match the change in SAR.

R-85: The station at Miles City was not included since the data at low flows are complicated by the diversion of most of the Tongue River water by the T&Y diversion dam at this time. An increase in SAR, EC, or any other single indicator, cannot be assigned to a single source without modeling flow and composition in the stream. As described in the SEIS, flow rate and composition are closely related in Montana's rivers. The samples mentioned for CBNG development lie entirely in the extended drought area experienced by Montana and much of the arid west. As stream levels drop, salts increase, and calculated indicators such as SAR frequently also increase. CBNG development activities are not expected in northern Custer County for the foreseeable future. As such, the analysis conducted for the Tongue River at Brandenburg Bridge (USGS Station 06307830) is believed to be representative of the water quality that will be experienced by irrigators near Miles City. Surface water monitoring conducted along the Tongue River does not indicate any noticeable differences in surface water quality due to CBNG development once flow is taken into account.

C-86: The tables begin on page 4-84. For water quality at the state line, the SAR has increased from 0.86 SAR to 1.93 SAR. This is a 124 percent increase in SAR level. How does this satisfy non-degradation? The purpose of the Clean Water Act is to protect existing quality. The SAR at Birney Day is estimated to increase by 131 percent. The SAR at Brandenburg is estimated to increase by 84 percent. There are no estimates done for Miles City. Why were no estimates done for Miles City? The data for the Powder shows that SAR increases by about 130 percent at the State Line and about 146 percent at Locate. The flow on the Little Powder River is increased by 430 percent (page 4-86). How does this meet the nondegradation requirement for flow? Alternatives A thru E show how the water quality will be affected pre-development versus post development. In Alternatives A through E, there are predictions that show that SAR will be affected by almost 130 percent on most of the alternatives.

R-86: See R-85. Also, the Tables in Chapter 4, Hydrological Resources, Alternative A, Effects on Surface Waters of the Tongue River Under Alternative A and similar tables for other alternatives are projections based upon conservative assumptions. The changes to water quality are well within MDEQ water quality standards. If there are changes in surface water quality requirements, water management practices will also need to be modified to ensure that standards are not exceeded.

C-87: Page 4-92 states that water discharges may have to be curtailed. When will this happen? It appears that there will be no controls placed on Wyoming. The Wyoming discharges alone could impair Montana rivers. This EIS has no control over Wyoming discharges. How will the Wyoming EIS be modified to stop discharges in Wyoming, once EPA has ruled that non-degradation is the law of the land?

R-87: Chapter 3, Hydrological Resources section, states that the numerical surface water quality limits adopted by the Montana Board of Environmental Review are enforceable upstream under the CWA. As such, both Montana and Wyoming may have to modify water management practices if EPA approves the designation of EC and SAR as "harmful" parameters.

C-88: If the TMDL will not be done until 2012, how can a good analysis be done in this SEIS regarding TMDLs? On Page 3-32, paragraph 5, it states the following: "The completion of TMDLs for the Tongue River for the parameters of concern, such as SAR and EC, should be included in the SEIS document to ensure that the proper permits must be obtained and complied with…."

R-88: Surface water quality models estimate surface water conditions. Findings of the TMDL will allow better modeling and prediction of surface water conditions. TMDLs will not be established until 2012.

C-89: The DSEIS proposes using CBNG water for "managed" irrigation. Most wastewater from CBNG wells has far too high a pH to be useful for irrigation. BLM does little to describe the factors that may make this option less than desirable. For example, the necessary amendments added to soils so that they can tolerate the highly saline CBNG wastewater are costly and would be needed on an ongoing basis. An economic analysis of these costs was not included. A review of the BLM-sponsored report that was published in 2005, Soil Chemical Changes Resulting from Irrigation with Water Co-Produced with Coalbed Natural Gas, by Girusha J. Ganjegunte et al. (Attachment L), provides information on the significant problems associated with using this wastewater as irrigation water.

There is little discussion in the DSEIS of the short- or long-term success of managed irrigation as wastewater management technology. Land application and disposal operations create significant problems, such as over-application and massive reclamation costs required for rehabilitation, especially of areas that were once rangelands (see below) after CBNG wastewater declines and disappears. Additionally, there is increasing evidence (increased SAR and EC levels) from the Wyoming portion of the basin that land application and disposal activities are resulting in unpermitted discharges of CBNG wastewater into tributaries of the Powder and Tongue rivers.

R-89: Irrigation is one of several water management options available. The potential for CBNG-produced water to be used for managed irrigation will depend on the quality of the produced water. The water quality can vary by coal seam, as well as by location of the development within the basin. The use of CBNG-produced water in Wyoming has shown that with the correct pH and use of other parameters it can be managed to allow short-term and long-term irrigation of various crops. An analysis of the potential effects resulting from the use of CBNG-produced water for irrigation is contained in the Soils Technical Report (ALL 2001a).

The decision whether to use CBNG-produced water for managed irrigation, or other types of crop irrigation, rests with the land owner, who will have to weigh the economic benefit against any increased cost.

C-90: On page 3-39, Table 3-9, the lower Tongue River has only one small segment listed as impaired for flow alteration, which does not reflect other impairments that were often discussed by the Tongue and Rosebud TMDL workgroup. Salinity is a parameter that should be listed as an impairment from the mouth of the Tongue River to the Montana/Wyoming stateline.

R-90: BLM is using MDEQ's determination of which stream segments are impaired. MDEQ does not list the noted segment as impaired.

C-91: On page 3-45, it states that groundwater drawdowns are of concern to the Northern Cheyenne Tribe as they pertain to aquifers on the reservation that provide drinking water from domestic wells and springs. Drawdowns that are reported to be around 594 to 20 feet 2 miles from a CBNG production field are not what the tribe favors. As the CBNG fields move closer to the tribe's boundaries, the need for added protection of tribal resources must be planned and implemented.

R-91: The Preferred Alternative, H, contains a Native American Concerns Screen which includes a 5-mile buffer around reservation boundaries. Within the 5-mile boundary, operators would have to demonstrate that the overall POD would be protective of Indian Trust Assets and air quality. If the site-specific analyses indicate that unacceptable levels of impairment would occur and could not be mitigated, BLM would not approve the APDs.

C-92: Calculations show that each CBNG well in the Dietz Project is expected to produce at an average of 14 gpm and will remove approximately 450 acre-feet of water in its 20-year life (Myers 2006). At an infiltration rate of 0.3 inch per year, it will take approximately 200 years for the aquifer to recharge after the 20-year operational period of the wells, assuming extensive simultaneous development of the CBNG extraction in the basin. If the Dietz Project were conducted in isolation, the recharge times would be reduced, and the expected recharge time over the footprint of the project would be approximately 150 years (Myers 2006). Recharge of the coal and sandstone aquifers in the area and

reestablishment of the supported springs in the area will not occur for at least 150 years after the Dietz CBNG development is completed. The SEIS does not contain an estimate of recharge rates for the coal seam aquifers in the Powder River Basin, nor any analysis of what factors influence recharge or the rate of recharge.

R-92: The SEIS estimated that the initial rate of water production from a CBNG well would be approximately 15 gpm and would decline over time with an average rate of water production of approximately 2.5 gpm. These numbers were derived from actual CBNG well water production rates for Wyoming and Montana. Using an average water production rate of 14 gpm over the life of the well will overestimate the quantity of water withdrawn, as well as the subsequent time required for recharge. Groundwater modelers assisting the Wyoming BLM determined that coal seams experiencing substantial drawdown also experience recovery as a two-part process. After CBNG development (and water removal) ends, within three to four years water levels in the coal aquifers are expected to partially recover to within 20 to 30 feet of preoperational conditions. Complete water level recovery will be a long-term process, likely requiring hundreds of years for the removed groundwater to be replaced through the infiltration of precipitation. A similar recovery process is expected to occur in the Montana portion of the basin. The 3D computer model conducted for the Montana 2003 FEIS predicted that aquifers within CBNG fields would be expected to recover at least 70 percent within five to 12 years. Aquifers outside of the CBNG fields would be expected to recover 90 percent within three to five years. Factors relating to aquifer recharge, including groundwater modeling results, are contained in the Hydrological Resources section of Chapter 4.

C-93: BLM has stated (during litigation proceedings) that impacts to tributaries were not evaluated during the first EIS process because "untreated produced water discharges to perennial tributaries of the Tongue and Powder Rivers are not likely to ever occur because of the water quality standards adopted by the State of Montana for such tributaries (i.e., EC = 500)." We have previously provided BLM with volumes of evidence refuting this assumption and showing untreated methane discharges (from impoundment failures, overflows, or creation of saline seeps) into Youngs Creek, Squirrel Creek, and Badger Creek—all tributaries of the Tongue River that flow through Wyoming CBNG development fields before emptying into the river. All the discharges were from total containment impoundments that failed. One failure discharged almost 2.5 million gallons of wastewater into Youngs Creek, measurably increasing pollution. We have documented numerous failures of impoundments in Montana and Wyoming resulting in similar discharges.

R-93: See R-5 and R-80. Application of current and proposed water quality standards for the state of Montana would likely prevent the intentional discharge of untreated CBNG-produced water to main stream tributaries.

C-94: The DSEIS has failed to seriously and adequately address the negative impacts that CBNG wastewater is having and will continue to have on irrigated agriculture.

R-94: The potential effects on irrigated agriculture relate primarily to the potential for impacts to soils from the discharge of CBNG-produced water with high EC and SAR values. Detailed analysis of resultant instream EC and SAR values are provided in Chapter 4. Potential effects are also detailed in the Soils Technical Report prepared for the 2003 FEIS (ALL 2001a). Detailed analysis of resultant instream EC and SAR values are provided within the Hydrological Resources section of Chapter 4.

C-95: In the DSEIS, BLM estimates that only 20 percent of the water discharged from CBNG production will be put to a beneficial use. Where did this number come from? BLM has not adequately addressed the BACT that exists for the management of CBNG wastewater.

R-95: The 20 percent number representing beneficial use is presented in Chapter 4 under the heading of Assumption Rationale, Beneficial Use of CBNG Production Water. CBNG-produced water management/treatment options, as well as potential effects resulting from project related activities, are discussed in the Hydrological Resources section of Chapter 4 and the SWQATR. EPA, not BLM, develops BACT requirements for each industry. EPA has not yet developed BACT for the CBNG industry.

C-96: BLM's surface water quality analysis was based on numerous unsupported assumptions and conclusions that likely underestimate the volume of wastewater that will reach the mainstreams of the Tongue and Powder rivers. First, BLM assumed that operators will use certain disposal methods in each watershed and then made assumptions about how much wastewater from each means of disposal would reach the mainstreams of the rivers. Second, BLM assumed that none of the wastewater put to a beneficial use (including land application and

disposal operations) or discharged into impoundments would reach surface waters. Third, BLM assumed that none or at least minimal volumes of wastewater discharge to ephemeral or intermittent tributaries of the Powder and Tongue rivers would ever reach the mainstreams. These assumptions are not supported by scientific data, have no basis in reality, and are wrong.

R-96: The assumptions referenced are based on data from current CBNG operations. A discussion of the assumptions used and the rationale is found under the headings of General Assumptions and Assumption Rationale within Chapter 4 and are further discussed in the SWQATR. It was assumed that 80% of this water would reach the mainstems.

C-97: There is evidence from the Wyoming portion of the basin showing that discharges into intermittent and ephemeral tributaries of the Powder River are, in fact, transforming these streams into perennial water bodies and reaching the mainstem of the Powder River. Many months of the year, the flows of these tributaries comprise entirely CBNG wastewater. The DSEIS does not address the potential impacts of transforming ephemeral and intermittent streams into perennial waterbodies, including the impacts on surface water quality; on stream morphology; on sedimentation and erosion rates (head cutting); on riparian vegetation, including spread of salt cedar (tamarisk) and killing of cottonwoods; or on native aquatic life, including reptiles and amphibians. Nor did BLM evaluate the toxicity of contaminants in the CBNG wastewater such as selenium, lead, cadmium, copper, and arsenic. This transformation of the intermittent and ephemeral tributaries represents a fundamental change in the ecology of these prairie ecosystems that will likely have devastating impacts. The DSEIS did not evaluate the impacts of such transformations on farming and ranching operations or the impacts of such discharges creating ice jams and resulting overland flows of water with high EC and SAR levels onto adjacent meadows. The DSEIS did not consider the impacts of such incidents on native soils and vegetation and the impacts of the potential loss of these resources on local ranches.

R-97: A detailed discussion of the potential effects resulting from project-related activities, including the discharge of CBNG-produced water, is contained within the resource sections of Chapter 4. The potential effects of constituents that have been found to be of concern for CBNG-produced water are discussed within the Hydrological Resources section of Chapter 4 and the SWQATR (Greystone 2002). The potential for those constituents of CBNG-produced water to affect soils, wildlife, aquatics, and vegetation are discussed within the relevant resource sections of Chapter 4. The potential to alter ephemeral drainages to a more perennial nature is discussed in Chapter 4, Hydrological Resources, Alternative C, under the Production Subsection.

C-98: BLM has not analyzed the impacts of LAD practices on the water quality of shallow groundwater resources and nearby surface waters by assuming—without providing any supporting data or studies—that none of the wastewater applied will reach groundwater or surface waters because the wastewater will be applied at agronomic uptake rates. In doing so, BLM ignores available studies showing the potential impacts of LAD operations on groundwater and surface water resources.

R-98: The potential effects to groundwater from managed irrigation or other land applications of CBNG-produced water are discussed in the SEIS via reference to the Soils Technical Report (ALL 2001a).

C-99: Is somebody going to be testing water that we use where it comes out of the Tongue River so that we know that the SAR and the other measurements are acceptable for our irrigation? And if not, what options do I have?

R-99: CBNG-produced water is tested before being discharged to ensure that it meets Montana Water Quality Standards. MPDES permits also require instream monitoring to ensure that standards are not exceeded. The Montana Water Quality Standards for EC and SAR have been developed specifically at levels that are protective of irrigation use.

C-100: If we have a process in Tongue River, the Rosebud, or even the Powder River, of exceeded water standards, what mechanism does BLM or DEQ or the state of Montana have in place when multiple companies are in that drainage? In other words, if we have high sodium levels and EC levels in the river and five companies at the head of it, who steps in and says you are the one who caused the problem? What is going to happen?

R-100: If an exceedance within a water body occurs, MDEQ would investigate the source, or sources, and implement measures to correct the cause of the exceedance. Once the source of the problem is determined, MPDES permits can be reopened and modified as needed.

C-101: Do BLM employees check water quality and quantity of discharges into the Tongue River, or is it self-reported by industry? The commenter believes it is self-reported by industry, and this is wrong; it should be performed by an independent party.

R-101: Water discharge sampling is conducted by industry and reported to MDEQ in accordance with its standards. MDEQ also conducts periodic site investigations and takes samples to ensure consistency with industry-collected samples and to ensure that industry complies with its permit requirements. BLM, USGS, MDEQ, and other state and federal agencies also collect water quality samples along the Tongue River and other rivers and streams in the basin to evaluate overall water quality and stream health.

C-102: The document mentions the importance of groundwater to agriculture. It does nothing to mitigate or protect it, nor did the original EIS. How does this fit with the mission statement of BLM?

R-102: See R-4. CBNG operators have to replace any water supply, including springs or groundwater supply wells used for irrigation or for any other purpose that is impacted by CBNG operations. This is accomplished through the execution of a water mitigation agreement with the landowner. Water rights issues are under the purview of DNRC, not BLM.

C-103: Our reservation lies right under and right on the Fort Union formation. Our reservation stands to have the most damage from this CBNG. Aquifers are going to deplete, and the water that is drained into the creeks and into the rivers is going to kill the ecosystems.

R-103: An element of the Preferred Alternative, Alternative H, is the Native American Concerns Screen, which establishes a 5-mile buffer around the reservation boundaries. Development within the 5-mile boundary would have to show that it would be protective of Indian Trust Assets (including groundwater) and air resources. All discharges to surface waters must comply with MPDES requirements.

C-104: In the last bullet point on Page SUM-8 in the summary, it says, "Surface water is the primary water source for Montana users. Groundwater is a minor source of usable water, however, in some areas groundwater is the only source of water for domestic stock use." A USGS circular, number 1081, published in 1993, contradicts this flatly. It says, "More than 50 percent of Montana's citizens rely on groundwater for drinking and household use." The Montana groundwater plan, published in 1998 by DNRC, repeats the USGS circular and adds this, "95 percent of rural residents depend on groundwater for their domestic water supply."

R-104: The statement in the Summary section refers to the volume of water used. Most of water used in Montana for industrial or agricultural uses comes from surface water. It is equally true that groundwater is a significant source for household use, particularly in rural areas; however, when compared to the larger volume of water used from surface water sources, the actual volume of groundwater used is relatively minor.

C-105: Under Preferred Alternative H, The water screen says, "if surface water monitoring indicates permitted levels of CBNG discharge have the potential to cause water quality standards to be exceeded, no future untreated discharge of CBNG water would be allowed from federal wells unless the regional surface water monitoring stations above and below the proposed discharge are active." If the application for discharge is recognized to have the potential to cause water quality exceedance, why allow it to occur without requiring the applicant to modify their discharge proposal? To rely on the monitoring stations to trigger alteration of the discharge puts correction of the problem behind a power curve that could and should be avoided in the first place.

R-105: If the threshold of 10 percent of the 7Q10 within the water screen is exceeded, the monitoring would be used to ensure that water quality standards are not exceeded. This monitoring will allow MDEQ to develop appropriate mitigation measures before exceedances are observed.

C-106: Under the DSEIS, companies must mitigate for the loss of water resources by providing a supplemental water source. It is, however, unclear if these supplements will be in place for in-stream water augmentation or if they are to supplement beneficial uses for off-stream landowners.

R-106: Supplemental water sources would be supplied to a landowner if water use, either from a groundwater supply well or spring, is impacted by CBNG operations. This water supplement is supplied by the CBNG operator under the provisions of a water mitigation agreement executed between the CBNG operator and the landowner.

C-107: BLM should implement a water monitoring system that will allow for the quantification of all CBNG-produced water discharge into the system at any given time. The availability of this information will assist with the study of potential impacts to aquatics.

R-107: BLM believes that the existing system of USGS stations and MPDES requirements for DMRs

is sufficient to assess changes in mainstem stream flows resulting from the discharge of CBNG-produced water.

C-108: The SEIS does not fully address the impacts of numerous evaporative storage basins across the landscapes on water quality and fisheries. Aquatics monitoring should take place on streams in the study area that are in areas where water management includes the use of storage ponds.

R-108: The potential for project-related activities to affect water quality and fisheries is discussed within the Wildlife Aquatics section of Chapter 4. Monitoring requirements for CBNG operations with respect to assessing aquatic biological diversity are included in the Monitoring Appendix. BLM has several ongoing studies considering these potential impacts.

C-109: Methane seepage into Tongue River Reservoir is noted, but it is not addressed. Are the impacts of seeping methane on the reservoirs fisheries to be addressed? Will this effort be incorporated into the overall monitoring program? Who is accountable for non-point source issues such as potential impacts to fisheries due to methane seepage?

R-109: Increased seepage of methane into the Tongue River Reservoir was reported by the MFWP; however, there have been no data to confirm this or reports of impacts resulting from methane seepage to fisheries.

C-110: Non-irrigation season standards for EC and SAR could have severe impacts on fish populations. The not to exceed standards (2,500 EC) are at levels that can impact fish eggs and juveniles (Skaar 2006). These standards potentially allow for operators to maintain discharges at the not to exceed level for extended periods of time so long as the monthly mean standard is met. This slug of poor-quality water could destroy eggs and juvenile fish during the early spring months of March and April. High SAR values could be seen under the same scenario.

R-110: The mean monthly standard for EC is 1,500, which operators would have to maintain. The not to exceed standard of 2,500 could not be maintained for an extended period and still allow for maintaining the mean monthly standard. The MDEQ developed these standards to protect all beneficial uses, including aquatic life.

C-111: On page 3-41, the concept that "some water, even if it is of poor quality, is better than none" may not be the best assumption to make. Prairie stream systems evolved with drought and function appropriately. The addition of poor-quality water may indeed be detrimental in the long term.

C-111: The text states that data indicate the high EC and SAR levels observed in 2005 are the result of low flows due to drought conditions. It does not appear that CBNG development had a measurable effect on the high EC and SAR levels that were measured.

C-112: On page 4-103, Hydrology, Alternative D, it states that an increase of 1,135 percent flow in the Rosebud Creek drainage for a sustained duration could be catastrophic to stream morphology. These soils are not accustomed to this type of flow or saturation, and they would be destroyed over time, resulting in the loss of this stream course's definition.

R-112: The referenced text refers to potential increases to flow in Rosebud Creek at Kirby, resulting from CBNG-produced water discharges under Alternative D, which was not selected as the Preferred Alternative. The text also outlines the potential impacts and states the following: "These increases in water flow rates would be likely to cause changes in streambed geometry, flow regime, stream depth distribution, presence and condition of in stream vegetation, and other physical factors associated with the stream and adjacent riparian zone."

C-113: On page 4-105, Hydrology: Alternative E, it states the following: "Water management based on site-specific water management plans (WMPs) allows for regulatory ability." Other alternatives seem deficient in holding industry to meet state and federal water quality standards. This alternative would secure fragile stream systems such as the Rosebud, because MPDES standards would be met.

R-113: The requirement for operators to submit site-specific WMPs is a component of Alternatives E, F, G, and H. Alternative H, the Preferred Alternative, also includes an additional water screen to further protect the water quality of streams and rivers that would receive CBNG-produced water.

C-114: On page 3-30 of the DSEIS, BLM states that the "Montana Department of Fish, Wildlife and Parks reports increased methane production in two water wells on the Tongue River Reservoir State Park as well increased seepage under the reservoir." What is the basis for this statement and are supporting data available for public review?

R-114: As the commenter notes, the text within the SEIS references the MFWP as the source for this information.

C-115: Before development proceeds, Miles City water quality exceedances in the summer of 2006 should be resolved. These exceedances led to soil damages on several farms along the Tongue River and should be addressed. How will damages to irrigated landowners be dealt with?

R-115: The Suarez Report, submitted June 2006, was not evaluated in the DSEIS because of a May 2006 submittal date for the draft document. The referenced report has been reviewed for the FSEIS.

C-116: Impoundments used to store CBNG-produced water can leak, even if lined, and therefore will get into the streams and rivers.

R-116: The use of impoundments will not be the case for all disposal of CBNG-produced water in the Powder River Basin. Remediation and monitoring of the impoundments will be included in the POD to ensure that produced water from CBNG wells does not adversely affect the surrounding environment.

C-117: Several farms obtain water for irrigation from the Tongue, Yellowstone, and Powder Rivers. Many of these farms are outside the Planning Area, as defined in this DSEIS, but could be affected by the discharge of CBNG-produced water into the Tongue and Powder rivers (which flow into the Yellowstone River). By excluding an analysis of how CBNG-produced water discharges will potentially adversely affect soils that are irrigated in and around Miles City, Terry, Fallon, and Glendive, the affected environment outside the Planning Area is not properly considered, and we believe this makes the DSEIS significantly deficient.

R-117: Discharge of CBNG-produced water into the Tongue or Powder rivers is regulated by the state of Montana, and operators must obtain MPDES permits to discharge. Furthermore, water quality along the Yellowstone River at Forsyth and Sidney is evaluated in the SEIS.

C-118: MDEQ, not BLM, has the authority to write water quality permits and enforce the Clean Water Act.

R-118: BLM recognizes that MDEQ has the lead role in managing water resources. BLM would coordinate all water monitoring efforts with MDEQ. While Onshore Order 7 reinforces BLM's approval authority for produced water disposal, it does not provide BLM with primacy for the management of water within the state of Montana. Therefore, BLM would apply the water quality screen in close coordination and under the lead of MDEQ. Close coordination would avoid duplication of effort and ensure that each agency fulfilled its roles with respect to resource management.

C-119: Under Results of Surface Water Monitoring, Page 3-41, it states, "As such it does not appear that CBNG development had a measurable effect on EC and SAR through 2005." Have this knowledge and the relevant data been considered and applied in the development of the new alternatives? If so, how, and in which alternatives?

R-119: BLM has recognized this study in the SEIS and chooses to ensure water quality is protected for all downstream users by implementation of the water screen under Alternative H. The fact that noticeable changes have not been seen with the current level of development does not necessarily imply that impacts at the RFD level of development will not be noticeable.

Indian Trust and Native American Concerns

Comment 1 (C-1): BLM did not address the full impact of CBNG extraction on Native American communities. The Northern Cheyenne have developed water quality standards that are awaiting EPA approval for their reservation. However, the draft supplemental EIS does not address how CBNG extraction would affect these proposed standards. BLM also did not assess the number and location of traditional cultural properties of the Lower Brule Sioux Tribe in the area (pp. 3-36, 3-86).

Response 1 (R-1): Impacts on Native American communities resulting from project-related activities are outlined in the Indian Trust and Native American Concerns section of Chapter 4. Water quality impacts specific to the Northern Cheyenne resulting from project-related activities for each alternative are in the Hydrological Resources section of Chapter 4. The tribe has adopted surface water quality standards for EC and SAR and has been granted treatment as a state status by EPA. EPA has not yet reviewed the tribe's proposed water quality standards, however, the tribe does not yet have Clean Water Act standing (see Chapter 3 Hydrological Resources, Surface Water). Surface water quality for the Tongue River (see Chapter 4 Hydrological Resources, Alternative C, Surface Water Analysis, Tongue River) and Rosebud Creek (see Chapter 4 Hydrological Resources, Alternative C, Surface Water Analysis, Rosebud Creek) would potentially exceed the tribe's proposed standards under Alternative C.

With regard to off-reservation TCPs, BLM requires cultural block surveys for most CBNG lands to be developed under each POD. These block surveys, coupled with tribal consultation requirements, demonstrate the ability to identify cultural sites and reduce the potential impacts associated with developing CBNG near cultural resources. Additionally, BLM has signed a memorandum of understanding with the Lower Brule Sioux to participate in the SEIS as a cooperating agency. BLM has also entered into government-to-government consultation with the tribe to address its concerns over TCPs within the Project Area.

C-2: Page MON-5: Regarding "Indian Trust Groundwater," the specific monitoring techniques, the frequency of monitoring, remedial actions, and management options listed are premature and inappropriate at the SEIS level. The need for and extent of groundwater monitoring around POD areas near Indian reservations should be determined within the context of the water management plan submitted with the POD application. At that point, operators will have developed specific CBNG production plans, identified coals to be produced, and site-specific geology. These elements are critical to establishing monitoring objectives and tasks. This level of information is necessary to determine whether hydrologic connectivity exists between the POD area and reservation aquifers. BLM will have the opportunity to conduct its review of such information, consult with tribes and the operator, and develop an appropriate groundwater monitoring plan.

R-2: The process would transpire as outlined above. CBNG development within the 5-mile buffer zone would require the operators to demonstrate within their water management plan that Indian Trust Assets or resources would not be impacted. The level of monitoring and remedial actions required would depend on site-specific conditions and results of the operator's analysis.

C-3: The Northern Cheyenne Mitigation Appendix summarizes the DSEIS's proposed mitigation measures resulting from the Native American Concerns Screen under Preferred Alternative H. The DSEIS does not, however, provide any data on how the 5-mile buffer is determined. This improperly shifts the burden of proof to CBNG operators. Instead of allowing CBNG development to take place, then making mid-course corrections if the development impacts tribal resources/interests, the DSEIS assumes that impacts will occur and improperly requires operators to prove at the outset that their development(s) would not affect tribal resources/interests. Next, the DSEIS does not acknowledge pre-existing lease rights. Denial of a permit under this Native American screen may be viewed as a federal taking. Would BLM buy back leases that operators cannot develop because they cannot prove that drainage of groundwater or CBNG will not occur? BLM is shifting its fiduciary responsibilities to the CBNG operator. Additionally, while the DSEIS does advise the reader that the Native American screen would result in a loss of gas resource to the nation, the agency does not quantify that loss and does not explain the collateral loss of local and state revenues. The DSEIS should acknowledge that the Native American Concerns Screen would probably lead to the loss of private and state gas resources because an operator might be less inclined to develop an area knowing he or she could not develop all of the gas; therefore, the project might be uneconomical. The DSEIS should also advise the reader that the Native American Concerns Screen is not applicable to existing federal leases lacking such a stipulation because of valid existing lease rights. Finally, the DSEIS should acknowledge the legal complexities of the Native American screen and how it might lead to a federal takings issue and increased litigation.

R-3: The 5-mile buffer was determined from groundwater modeling conducted for the 2003 FEIS, which showed that groundwater drawdown at a distance of 5 miles was minimal. BLM has a responsibility to protect Indian Trust Assets, which include CBNG and groundwater. PODs submitted for existing federal leases would be subject to the provisions of the Native American screen and would have to show that the proposed development would not impact Indian Trust Assets or resources. BLM understands that local geologic conditions combined with mitigation measures would determine where and how much development would occur within the 5-mile buffer. Some loss of the federal CBNG resource might result from the provisions of this screen and BLM's responsibility to protect Indian Trust Assets. The amount of gas resource potentially lost to the federal government and foregone revenue are detailed within the Geology and Minerals and Social and Economic Values sections of Chapter 4. Due to many factors, it is impossible for BLM to predict how economics might affect development on private and state leases within the 5-mile buffer zone if development were to be restricted on adjoining federal minerals.

C-4: Page CHE-2: The DSEIS should explain the increase in the proposed buffer zone around reservations from 2 miles in the 2003 statewide FEIS to 5 miles in the DSEIS. As cited in the DSEIS,

recent studies (Wheaton et al. 2006) indicate that the extent of CBNG drawdown is lower than expected. The third paragraph on this page states, "Groundwater monitoring to date indicates drawdown has extended approximately 1.5 miles from production fields." This is after approximately 6 years of CBNG production in the CX Field area. Since BLM states it uses adaptive management, it should provide justification for the larger buffer zone. BLM's provision requiring site-specific determination of potential impacts based on hydrologic connectivity to reservation groundwater resources is a superior criterion. The last sentence under Alternative H mentions "to demonstrate model adequacy." Which model BLM references is unclear. The discussion immediately above refers to the modeling performed for the statewide FEIS (by Montana Bureau of Mines and Geology [MBMG]). BLM should clarify that operators do not have to model groundwater. We suggest that BLM specify that the demonstration of no impacts to reservation groundwater be submitted with the water management plan in the POD application, unless the parties agree to other provisions.

R-4: The 5-mile buffer was determined from groundwater modeling conducted for the 2003 FEIS, which showed that groundwater drawdown at a distance of 5 miles was minimal. Recent studies do indicate that groundwater drawdown resulting from development at the CX Field extends out approximately 1.5 miles. When considering the effects from all of the wells predicted, however, groundwater modeling results indicate drawdown could be up to 5 miles. The referenced sentence on page CHE-2 states, "Additional monitoring of groundwater and air may be required to demonstrate model adequacy." This refers to modeling that the operator may have to conduct to demonstrate that development would not adversely impact Indian Trust Assets and resources. Language in the FSEIS has been modified to clarify that methods employed to demonstrate that Indian Trust Asset groundwater will not be adversely impacted will be submitted as part of the water management plan in the POD application, unless the parties agree to alternative provisions.

C-5: Page CHE-4: The lower portion of Alternative H states, "Where there is potential for affecting reservation groundwater…" BLM should define what it means by "potential."

R-5: Before development, operators would have to demonstrate within their water management plans that Indian Trust groundwater would not be impacted. Should that analysis indicate that Indian Trust groundwater could be impacted, then there would be a "potential for affecting reservation groundwater."

C-6: Page CHE-27: Regarding protection of culturally important springs under Alternative H, BLM should clarify that operators would have to evaluate potential impacts of proposed CBNG operations only on those springs that the tribal authority identified to BLM and for which it provided basic information, including adequate location, flow, and water quality data. The tribal authority would also agree to assist BLM and the operator in obtaining that information for springs that lie within the anticipated drawdown radius of the proposed development.

R-6: BLM would consult with tribal authorities and work with operators to identify TCPs, including springs, located within the Planning Area before development. The Northern Cheyenne Document and 2002 Ethnographic Overview have lists of springs to assist the applicant in determining if culturally important springs are present in their POD areas.

C-7: Page CHE-28: In the second row under Alternative H, BLM should revise this to state that operators could be required to monitor the condition of culturally significant springs. The springs would be identified by the tribal authority only where there would be a reasonable potential for impacts, based on a site-specific hydrologic evaluation associated with APD approval, and where the tribal authority would agree to assist in the monitoring.

R-7: The current language states that monitoring would be required only "where there is the potential for production activities to impact the springs." BLM believes that this language is adequate, and operators should not assume that tribal authorities would agree to assist in the monitoring.

C-8: The standards proposed in the Native American Concerns Screen are arbitrary and ill-defined. For proposed development within 5 miles of the Northern Cheyenne and Crow reservations, site-specific groundwater and air analyses would have to be submitted along with the POD. However, Alternative H does not specify what these analyses would entail, further eroding an operator's ability to determine a business plan that would adequately include the costs of regulation. If rules were made up as the process moved from the leasing phase to the exploration and development phase, operators would not be able to assess whether implementing a business plan in a given area would be feasible. This would put small, independent operators at a particular disadvantage. The SEIS does not define the standards for

"unacceptable levels of impact," further rendering this screen arbitrary. The table in the Monitoring Index does not contain the standards for this screen.

R-8: The type of site-specific air and groundwater analyses required under the Native American Concerns Screen is left up to the operator with the only requirement being that it is sufficient to demonstrate whether the proposed development would have an impact on Indian Trust Assets or resources. The level of impact that would be deemed unacceptable would depend on site-specific factors such as proximity of the development to culturally significant springs or groundwater use wells and expected impact, as well as the type of operational equipment and air emission control measures proposed in the project POD.

C-9: The Native American Concerns Screen states that, as development proceeds, BLM would monitor the effects on air, water, and "other resources of concern to Native American tribes." So not only would BLM take over jurisdiction from the state for regulating air and water, it could decide that other resources are now of concern and deny any further APDs accordingly. This, in effect, would extend the jurisdiction of the tribes 5 miles into BLM administered lands that adjoin theirs.

R-9: The 5-mile buffer does not extend the Tribe's jurisdiction. It extends BLM's area of concern for potential effects to Indian Trust Assets. The BLM would work with the appropriate regulatory agency if monitoring indicated that an air quality or water standard may have been exceeded.

C-10: The 5-mile buffer zone described in the Native American Concerns Screen to protect water and air obscures a problem with Alternative H. In Chapter 4, page 200, BLM admits that if development of federal minerals were delayed or restricted in the 5-mile buffer zone, there would be an increased potential for drainage of federal minerals. As much as 1.4 to 1.6 trillion cubic feet (tcf) of gas might be lost to federal, state, and county governments, with a loss of royalties to the federal government of $1.2 billion at current gas prices. This is a significant economic loss to Montana, which would otherwise receive $600 million. Alternative H does not contain any plan for mitigating this loss of federal minerals.

R-10: BLM recognizes that implementation of the Native American Concerns Screen could result in restricted development of federal minerals within the 5-mile buffer. The numbers contained in Chapter 4 reflect what would happen if no development were to occur on federal minerals within the 5-mile buffer.

C-11: It is not clear from the SEIS that BLM has adequately contacted the numerous tribes with historical associations with the region under discussion. For Rosebud Battlefield alone, this would entail discussions with the Northern Cheyenne, Crow, several bands of the Sioux, Shoshone, Arapaho, and Utes. In addition, there are tribes that were active in this region and the area farther to the east that merit consultation for the planning area covered by this document.

R-11: BLM has held meetings with the Northern Cheyenne, Crow, and Lower Brule Sioux Tribes concerning the SEIS and proposed activities. As operators propose specific sites for development, consultation and meetings with additional tribes may become necessary. BLM contacted the tribes identified in the 2002 Ethnographic Overview of Southeast Montana. Twelve tribes were contacted with an invitation to participate as cooperating agencies. Of those, two tribes elected to become cooperating agencies for the SEIS (for additional information see Chapter 5 under the headings of Consultation and Coordination with Native American Tribes and Official Cooperating Agencies).

C-12: Northern Cheyenne representatives and others have repeatedly expressed concerns related to the impact of CBNG development on aboriginal lands, indicated that their right to a government-to-government relationship among themselves and the United States was being undermined, and stated that the heritage of the tribe is being threatened. Has BLM contacted and consulted with these tribes? Has the agency developed any formal consultation process through memoranda of agreement or other approaches to help ensure meaningful consultation? Has BLM followed its own 2004 Manual Tribal Consultation under Cultural Resources in the development and consultation for this SEIS?

R-12: In accord with BLM Manual on Tribal Consultations, BLM has held consultations and meetings with the Northern Cheyenne, Crow, and Lower Brule Sioux Tribes concerning the SEIS and proposed activities. The consultations and meetings held are listed in Chapter 5 of the SEIS. The Crow Tribe and Lower Brule Sioux Tribe signed a memorandum of understanding with BLM to become a cooperating agency for the development of the SEIS. A Memorandum of Understanding to become a Cooperating Agency was offered to the Northern Cheyenne Tribe, which declined.

C-13: Within the Native American Concerns section of Chapter 3, subheading Aquatic Resources, Bighorn Lake is listed as being a highly valuable

recreational fishery. The same emphasis is not being given to the recreational fishery in the Tongue River Reservoir. This fishery is the premier crappie fishery in the state and often ranks in the top 10 sites within Montana for angling opportunity. This system receives over 100,000 recreation days of use each year, primarily related to angling activities. Emphasis has to be given to the protection of this resource.

R-13: The Tongue River Reservoir is recognized as an important fishery and recreational site within the Planning Area. It is not emphasized within the Native Americans Concerns section of Chapter 3 because it is not located within the boundaries of a reservation.

C-14: Under the section detailing the "Native American Concerns Screen," Alternative H would require site-specific groundwater and air analyses from operators. The analyses would be intended to demonstrate "that the overall POD would be protective of Indian Trust Assets (groundwater and CBNG) and air quality," and must not indicate an "unacceptable level of impairment to these resources" (DSEIS at 2-22). As a preliminary matter, BLM's attempt to push an affirmative obligation to conduct these initial analyses down to operators and, in effect, prove a negative, is inappropriate. Moreover, this requirement is unnecessary to ensure protection of Indian Trust Assets and would likely prohibit all development in those areas. Given BLM's obligation to manage federal lands for alternative multiple uses, see the DSEIS at 3-88, BLM should adopt its previous preferred alternative, Alternative E, under which BLM would have ample authority to impose appropriate mitigation.

R-14: See R-3. Additionally, the elements of Alternative E, such as the requirements for CBNG operators to submit PODs and conduct monitoring, have been carried over into Alternative H. Because of new data and information obtained since the Record of Decision for the 2003 FEIS was signed, Alternative H was developed to include an adaptive management approach, four resource screens to evaluate PODs, and mitigation measures implemented during development to better protect resource values within the CBNG development area.

C-15: It is conceivable that observed impacts could be the result of development on private or state minerals. Please include provisions/define protocols to differentiate between impacts to Indian Trust Assets that result from private and state development and those that result from development of federal minerals. Also, please provide details/plan for developing a coalition of buffer zone operators to optimize monitoring and share monitoring results.

R-15: BLM has a responsibility to protect Indian Trust Assets, including natural gas. However development of public domain gas resources wouldn't necessarily be precluded. BLM would have to evaluate a proposal and determine if Indian Trust Assets would be protected or if any additional mitigation might be required to assure BLM that the ITAs were protected.

C-16: If development occurs on an Indian reservation (i.e., private minerals, allottee minerals, or tribal minerals), please state clearly how this would change the management of the 5-mile buffer around the reservations. Furthermore, please establish and justify a threshold of wells to be drilled on an Indian reservation before the buffer zone would be removed.

R-16: The development of mineral resources within the boundaries of a reservation, whether it be on private, allottee, or tribal minerals, would not change BLM's responsibility to protect Indian Trust Assets or resources from development outside of a reservation boundary. If CBNG development occurred on a reservation, the requirements of the Native American Concerns Screen might be modified in consultation with the tribes and other affected parties.

C-17: We are concerned regarding the Native American Concerns Screen, especially because the SEIS has no additional impacts beyond those included in the 2003 EIS. The 2003 EIS had a 2-mile buffer around the Indian reservations as an element of Alternative B, which was not selected as BLM's preferred alternative. Since no new information has been included in the SEIS that would justify the inclusion of a 5-mile buffer in the preferred alternative, it is recommended that BLM remove this screen from the preferred alternative and instead incorporate the mitigation measures outlined for Alternative E contained in the Northern Cheyenne Mitigation Appendix. Please explain/clarify how the 5-mile distance was determined and how BLM and tribal consultation process would work (i.e., time limits, ability of operator to attend consultation meetings, types of appropriate analyses that might be required, etc.).

R-17: See R-4 and R-14. Additionally, with respect to the consultation process between BLM and tribal authorities, after a POD is received, BLM would hold consultations with the appropriate tribal authorities as part of the POD review process. The consultation process would identify any TCPs within the development area and, depending on the location of the development (i.e., whether it was located within the 5-mile buffer around a reservation boundary), indicate any potential impacts to ITAs or resources. If

TCPs occur within the development area, or if the development is within the 5-mile buffer and there is a potential for impacts to ITAs or resources, BLM would then work with the operator to avoid potential impacts to TCPs and ITAs or resources.

C-18: BLM has failed to provide any rationale in the SEIS for the proposed 5-mile buffer around Indian reservation lands. It is not evident whether BLM consulted with the tribes or they agreed that such a buffer is needed or wanted.

R-18: See R-3 and R-4. With respect to consultations with tribal authorities concerning the 5-mile buffer, meetings held with tribal authorities as part of the SEIS development process are detailed in Chapter 5. During a scoping meeting held at Ft. Keogh in September of 2005, both the Northern Cheyenne and Crow Tribes expressed interest in having a buffer around their respective reservation boundaries.

C-19: Although BLM Miles City Field Office staff have worked diligently on the SEIS and have made great efforts to include the tribe and our concerns, we remain steadfast that the SEIS does not entirely or accurately portray the effects that will be realized by the Northern Cheyenne people and our resources upon development of CBNG.

R-19: BLM appreciates the concerns expressed by the Northern Cheyenne Tribe and believes that every effort has been made to address those concerns and accurately describe the potential impacts that could result from the proposed project activities within Chapter 4 of the SEIS. BLM will continue to work with the tribe through consultations on specific PODs to avoid or mitigate potential impacts from proposed development.

C-20: The Northern Cheyenne Tribe is very concerned with the likelihood of its CBNG and groundwater resources being drained by adjacent, off-reservation CBNG development. BLM has a trust responsibility to protect the tribe's resources. We believe that BLM's proposed management methods (i.e., the four screens outlined in Alternative H and relying on operators to do the analyses on trust resources such as air, CBNG, and groundwater) do not do enough to fulfill this responsibility. Another concern is the lack of a mitigation measure to ensure the necessary involvement of the tribe in the standard APD review and approval.

R-20: BLM believes that the use of adaptive management and implementation of the four resource screens contained in Alternative H, combined with tribal consultations on individual PODs, would provide the means to protect Indian Trust Assets and resources. BLM is committed to working with the tribe to protect its ITAs and resources through consultations on proposed PODs.

C-21: With respect to Chapter 3, the Northern Cheyenne Tribe completed a report entitled, "The Northern Cheyenne Tribe and its Reservation 2002: A Report to the US Bureau of Land Management and the State of Montana Department of Natural Resources and Conservation." As was the issue in 2003, the report still is not incorporated to the extent necessary. Specifically, the report contains invaluable data and information related to how the Northern Cheyenne Tribe and the services provided by the tribe would be impacted upon development of CBNG. The tribe requests that BLM review its report again and include more data from it to better portray the current state of the reservation.

R-21: The report entitled, "The Northern Cheyenne Tribe and its Reservation 2002: A Report to the US Bureau of Land Management and the State of Montana Department of Natural Resources and Conservation" is summarized in the Native American Concerns section of Chapter 3 under the heading of Northern Cheyenne Reservation. Additionally, readers are referred to a website where the entire report can either be viewed or downloaded for more detailed information. Within Chapter 4, potential impacts specific to the Northern Cheyenne Tribe are described for each alternative and each resource value.

C-22: While the DSEIS specifies a series of mitigation measures that are part of the preferred alternative for the Northern Cheyenne, we note that there are no comparable specific measures listed for the Crow Tribe.

R-22: The commenter is correct. The Northern Cheyenne Tribe proposed the mitigation measures contained within the Northern Cheyenne Mitigation Appendix on August 13, 2002. The Crow Tribe did not propose any corresponding mitigation measures; however, they did request that the 5-mile buffer provision within the Native American Concerns Screen be applied to the Crow Reservation boundary.

C-23: One of the big issues that the commenter is very concerned about is that there is no hard analysis on socioeconomic or cultural impacts to the Northern Cheyenne Tribe.

R-23: Potential social, economic, and cultural impacts relative to the Northern Cheyenne Tribe are contained within the Indian Trust and Native American Concerns section and Social and Economic Values section of Chapter 4.

C-24: The commenter is concerned that tribal culture is being impacted, both directly and indirectly. It is impacted directly in that, with development, developers will sometimes be unable to avoid burial sites and other culturally significant properties to tribes. This would have a direct effect on tribal culture.

R-24: Project-specific mitigation of sacred, historic TCPs, or cultural resources related to tribal interests, topography, and concentration of sites would be addressed through the consultation process with the Native American tribes that have an interest in the area being proposed for development. If sacred or traditional sites exist in the area, the affected tribe would be consulted before determining appropriate action or treatment. Additionally, mitigation measures specific to the Northern Cheyenne Tribe for the protection of tribal resources and cultural sites are contained in the Northern Cheyenne Mitigation Appendix.

C-25: The commenter is concerned that if BLM honestly took its trust responsibility seriously, it would have the Northern Cheyenne Tribe included in the SEIS, in the mitigation measures, and have a plan lined out in that document stating how BLM would work with the tribe, what BLM would do, and what BLM could do and would not do, and what BLM would be unable to do.

R-25: See R-11 and R-12. Meetings and consultations held with the Northern Cheyenne Tribe during the development of the SEIS are contained in Chapter 5 under the heading of Consultation and Coordination with Native American Tribes. In addition, measures to mitigate potential impacts specific to the Northern Cheyenne Tribe are detailed in the Northern Cheyenne Mitigation Appendix. BLM also has written policy concerning consultation with Native American Tribes contained within BLM Manual on Tribal Consultation which spells out the provisions that BLM should follow in coordinating with tribal authorities.

C-26: BLM's protections offered for the Northern Cheyenne's resources, by BLM's own assessment in the EIS, will most likely result in groundwater loss from the Northern Cheyenne Reservation. In order to protect these resources the BLM has offered a 5-mile buffer zone in which development of methane will undergo additional scrutiny in the permitting process. The DSEIS indicates that ground water draw-down may occur up to 22 miles away from a producing CBNG well. A 5 mile buffer is clearly not enough. The DSEIS also states that "CBNG development would threaten to drain methane resources under tribal lands in the planning area." BLM should guarantee, not speculate, that it can protect the draining of tribal gas and water resources, as it is part of BLM's trust responsibility.

R-26: See R-3 and R-4. The reference to a potential 22-mile drawdown is from a 3D model conducted for the Wyodak EIS (Wyoming). It specifically calls for a 5-foot potential drawdown. Furthermore the reference cited on page 4-131 of the DSEIS is for Alternative B and not the Preferred Alternative (H). Alternative H states implementation of the BLM mitigation measures, coupled with the 5-mile monitoring proximity, would reduce the likelihood that any reservation groundwater resources would be drained from off-reservation federal CBNG activities. Furthermore current operations at CX range (4 years of extraction) indicate that drawdown of 20 feet is noted at a distance of 1 to 2 miles. Modeling of a 20-foot drawdown can be accomplished with a greater degree of certainty than modeling a 5-foot drawdown, particularly in consideration of site-specific differences in geology. For these reasons, and due to the uncertainty associated with modeling a 5-foot drawdown contour, the SEIS uses the 20-foot drawdown contour to represent the extent that results from CBNG development. Based on the 3D model prepared for the analysis, the 20-foot contour can be expected to extend 4 to 5 miles from the edge of CBNG production.

Paleontological Resources

C-1: "The BLM APD contains guidance for notifying and mitigating damage to paleontological resources discovered during oil and gas construction activities." Surveys should be conducted before surface activities. "Surface occupancy and use is prohibited within designated paleontological sites." Designated by whom? The word "designated" should be changed to "known" paleontological sites. This would include sites known by surface owners (state, federal, or private) and those subject to surveys to determine appropriate activities and/or mitigation.

R-1: BLM has designated several ACECs within the Planning Area on the basis of the potential for those sites to contain significant paleontological resources. Not all known paleontological sites are considered significant. BLM does address the potential for significant paleontological finds before development when activity is in an area where the geology indicates such finds are possible.

Social and Economic Values

Comment 1 (C-1): BLM should not assume that all workers will come from Wyoming and will not live on or near a reservation. Social issues due to increased population on reservations (drug, alcohol, crime, and other socioeconomic problems) are not addressed.

Response (R-1): Based on discussions with the CBNG industry, this assumption is warranted. The CBNG industry in the region is based primarily out of Sheridan and Gillette, Wyoming. Social problems that come with increased population on reservations are discussed in the socioeconomic analysis in Chapter 4.

C-2: The economic impacts of adopting Alternative H over Alternative E are not addressed. Alternative H is more stringent than Alternative E and will limit potential economic benefit for the Powder River Basin and surrounding areas.

R-2: Economic impacts for Alternative H are addressed in the Socioeconomics section of Chapter 4. In general, the socioeconomic effects of Alternative H are more similar to Alternative F than to Alternative E.

C-3: The DSEIS does not provide any discussion of the growing national demand for natural gas and the potential contribution of the Montana portion of the Powder River Basin.

R-3: The Social and Economic Values section of Chapter 3 provides information on current socioeconomic conditions within the Planning Area. Positive and negative socioeconomic effects from project-related activities are presented in the Social and Economic Values section of Chapter 4. Current natural gas supply and demand are constantly changing and can be obtained easily from numerous government websites, including the Department of Energy.

C-4: The DSEIS does not provide any CBNG employment data in Montana or any discussion about the various types of employment (e.g., company and contractors).

R-4: Employment by sector is provided in Tables 3-30 and 3-31, with CBNG jobs included in the mining sector. As stated in the SEIS, the CBNG industry in the region is based primarily out of Sheridan and Gillette, Wyoming. The types of jobs are discussed in the Social and Economic Values section of Chapter 4, Social and Economic Values Assumptions.

C-5: BLM has to update the tables for employment by category, unemployment, and per capita personal income. The U.S. Department of Commerce has changed before, so data before 1999 are inconsistent categories segregating industries for employment data. Unemployment rates across the counties have fallen to unprecedented low levels within the last 7 years. More recent unemployment data show levels below what is presented in the DSEIS and reflect a significant change in labor market conditions in the planning area. Per capita personal income has also risen.

R-5: Employment by category data within the SEIS was based on the most recent data available when the report was prepared.

C-6: The DSEIS does not incorporate information from the Executive Summary of the Economic Review of the Travel Industry in Montana, 2006 Biennial Edition or the Montana Tourism and Recreation Strategy Plan 2003-2007. The DSEIS does not address impacts on Montana's travel and tourism industry and the effects on the state's economy as a result of oil and gas development activities.

R-6: The potential impacts on recreational opportunities, including tourism-related opportunities such as hiking, hunting, fishing, and water activities, within the Planning Area from project-related CBNG activities are presented within the Recreation section of Chapter 4. The economic impacts resulting from project-related CBNG activities are presented in the Social and Economic Values section of Chapter 4. These impacts would affect both Montana residents and visitors.

C-7: Lessees have a qualified right to development on leased lands. Phased development under Alternatives F, G, and H will result in a delay of CBNG resource development on federal leases. During any such delay in development, lessees' federal leases will be drained, devaluing their property and contract rights. They will be arbitrarily subjected to disparate treatment based on a phased plan. If BLM's decision to phase development results in a delayed consideration of applications, this decision could mature into a contract violation.

R-7: The potential for drainage of federal mineral due to phased federal development resulting from implementation of the four resource screens contained in Alternative H is discussed under the Geology and Minerals section of Chapter 4.

C-8: The DSEIS states that workers would most likely come from Sheridan and Gillette. Are these

workers reporting their time in Montana to the Department of Revenue in Montana? How much income taxes are these workers paying to Montana? How many tax dollars is Montana losing from these workers? These workers are also filling their fuel tanks in Wyoming. If they fueled in Montana, the state would obtain fuel tax money to maintain roads. Where will Montana get the money to maintain the roads that will be overrun with employees from Sheridan and Gillette?

R-8: Taxes from income and fuel would likely benefit both Wyoming and Montana. The state of Montana and counties within the Planning Area would also receive income from property taxes and royalties paid by operators. These funds would be available for maintenance of roads, subject to state and local regulations.

C-9: BLM should complete a more in-depth analysis of the current social state of the Northern Cheyenne Reservation. It should include a subsequent analysis of the impacts of CBNG development, similar to the 1990 analysis for the Powder River Basin coal lease sale program.

R-9: As noted in the Social and Economic Values section of Chapter 4, the types of effects identified in the 1990 analysis are not expected to occur. While coal development employs many Montana workers, most the CBNG jobs would be filled by workers currently employed by the CBNG industry based in Wyoming.

C-10: BLM should not assume that most CBNG workers will commute from Wyoming for the duration of the development, production, and abandonment of CBNG wells. Making this assumption means that impacts from any potential workforce relocating to Montana have not been considered. BLM did not adequately analyze the possibility of temporary living quarters, such as "man-camps," recreation vehicle (RV) camps, or motels. This is especially relevant to the area north of the Northern Cheyenne Reservation, once it is developed.

R-10: See R-1. The potential for CBNG workers to use camping facilities or motels at work sites that are more distant from their base of operations is also discussed in the Social and Economic Values section of Chapter 4.

C-11: BLM should include reports and research related to negative social change, such as crime and drug rates, associated with CBNG development in its analysis of social and economic values. For instance, a report prepared for the Sublette County, Wyoming Attorney's Office, titled "Sublette County Statistics on Drug and Crime Rates," discusses how oil and gas development has affected drug and crime rates the last 7 to 10 years in Sublette County, Wyoming. The report indicated that crimes and arrests correlate highly to oil and gas field activity and increase with mineral development. These crimes and arrests consist of drug, burglary, domestic violence, and petty crimes. Drug use by oil and gas field workers is of particular concern. Even assuming that Sheridan, Wyoming, will be most affected by CBNG development in Montana, the regional increase in availability of drugs to the reservation will only compound the already rampant drug and alcohol problems on the reservation.

R-11: BLM has reviewed the crime information from Sublette County and does not believe it warrants a change in the analysis. The impacts in Sublette County were related to substantial population increases due to immigrating oil and gas workers. BLM does not predict population increases on the reservation due to CBNG development. CBNG operators and subcontractors may have to drive across the Northern Cheyenne reservation to reach some well sites in the northern part of the Planning Area (Rosebud County). Although the number of wells to be developed north of the reservation is relatively small, limited traffic, noise, safety, and road maintenance impacts could occur. This could increase tribal member contact with outsiders, increasing the negative effects of social change described above. Workers commuting back to Sheridan on a daily basis would, however, have few reasons to stop on the reservation. Any workers who lived in temporary housing north of the reservation would be more likely to use facilities in Colstrip than on the reservation. Also see R-1 and R-10.

C-12: The EIS should address the economics, farming, agricultural well-being, and industry of the lower Tongue River.

R-12: The SEIS presents data on the potential effects of project-related activities on the economy and agricultural operations within the Planning Area in general. It does not emphasize the Lower Tongue River or other watersheds.

C-13: The DSEIS does not include a socioeconomic impact study.

R-13: The analysis of socioeconomic impacts is provided in the Social and Economic Values section of Chapter 4. See also R-9.

C-14: The inclusion of a 5-mile buffer zone around the Crow and Northern Cheyenne reservations

represents a "federal taking" as these land and/or mineral owners would be prevented from their right to develop their resources and would be entitled to compensation.

R-14: The minerals within the 5-mile buffer zone around the reservations are not excluded from development. The inclusion of the 5-mile buffer around reservation boundaries within Preferred Alternative H provides for protection of Indian Trust Assets and requires operators to conduct additional studies and monitoring to ensure that these ITAs are protected before APD approval and during operations.

Environmental Justice

C-1: Pages 2-38 and 4-203: Under "Environmental justice," Wyoming disagrees that its management of CBNG discharges in Wyoming will create an environmental justice issue. All CBNG discharges in Wyoming and Montana must meet federal and state requirements. As long as those requirements are met, it is inconceivable that an environmental justice issue can occur. Reference to WYDEQ management of CBNG discharges in Wyoming creating environmental justice issues should be deleted from the document.

R-1: BLM believes that the language concerning the potential for an environmental justice issue is accurate.

Soils

Comment 1 (C-1): The SEIS states that there will be no impacts to soils. What is the basis for this and how was it determined? What about saline seeps?

Response 1 (R-1): The potential for impacts to soils, including salinization, from the discharge of CBNG-produced waters is available in the Soils section of Chapter 4. Additional information is found in the Soils Appendix and in the Soils Technical Report (ALL 2001a).

C-2: The SEIS states the following: "Soils with lower cation exchange capacity (CEC) potential would result in greater geochemical changes to infiltrating water." In the case of infiltrating produced water, the primary factors affecting its quality are the nature and extent of soluble salts naturally present in the soil and rock formations through which the water passes.

R-2: CEC is one of several factors affecting geochemical changes to infiltrating water. This statement in the SEIS pertains only to the CEC discussion.

C-3: It is incorrect to generalize that the soils in the emphasis area are generally clayey.

R-3: A description of soil classifications in the planning area can be found in the Soils section of Chapter 3, while additional information can be found in the Soils Appendix. The text in the SEIS states that soils within the Planning Area "generally range from loams to clays, but are principally loams to silty clay loams." Soils data used in the SEIS were derived from the Soils Survey Geographic Database (SSURGO) at http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/index.html.

C-4: The SEIS statement that the saline water has a more persistent and detrimental effect on soil productivity, especially when immediate mitigation measures are not followed for cleanup, is misleading. Salinity in water does not directly impact soils; it simply makes it more difficult for plants to extract water. Also, it is unclear what immediate "mitigation measures" and "cleanup" mean in the statement. This sentence should be deleted.

R-4: The meaning of soil productivity within the SEIS relates to the ability of plants to thrive in the surrounding environment. Changes have been made within the Soils section of Chapter 4 under the heading "Alternative C – Emphasize CBNG Development" to avoid confusion in this statement.

C-5: When will screening guidelines begin? Where are the screening guidelines for soils in the EIS? Does the SEIS contain a soil screen for the Lower Tongue River and for T&Y property?

R-5: Implementation of the provisions, or guidelines, contained within the four resource screens that are part of Alternative H would begin during BLM's review of an operator's POD. MDEQ has specific regulations in place to address the quality of water discharged from CBNG operations. Therefore, a separate screen to address produced water discharged to soils was not deemed necessary.

C-6: On page 3-54, BLM discusses "managed irrigation" (land application and disposal activities) as one option available for putting water produced from CBNG wells to beneficial use. However, BLM does little to describe the factors that may make this option less than desirable. For example, the amendments added to soils so that they can tolerate CBNG-produced water are costly and would be needed on an ongoing basis. An economic analysis of these costs was not included. A review of a 2005

BLM-sponsored report, Soil Chemical Changes Resulting from Irrigation with Water Co-Produced with Coal Bed Natural Gas, Girusha J. Ganjegunte et al., provides information on the significant problems associated with using this wastewater as irrigation water.

R-6: The referenced discussion introduces managed irrigation as an option under water management, identifies the possible problems associated with using CBNG-produced water for LAD or irrigation, and addresses the need for soil amendments, as well as water treatment, if this method is used. Not all produced water is of the same quality, nor are all soils in the Powder River Basin the same. All crops do not have the same tolerances to salinity. The identification of this method as an option does not obligate any surface owner to use this method. If the economies of receiving produced water for agricultural development do not work under particular site-specific circumstances, other options could be used.

Vegetation

Comment 1 (C-1): The DSEIS does not clarify who will monitor roads and well sites for weed invasions.

Response 1 (R-1): The implementation of weed control measures will be overseen by BLM.

C-2: The DSEIS (page 4-229) indicates that only 60 percent of the disturbed vegetation will have to be covered with prescribed vegetation. In instances where the surrounding land cover is 100 percent vegetated, 60 percent will be insufficient vegetation cover because it leaves areas open for weed invasion. In other areas where the surrounding land cover is barren, 60 percent may be too great a coverage to achieve.

R-2: The Vegetation section in Chapter 4 states, "Reclamation work will be considered complete when the disturbed area is stabilized, soil erosion is controlled, and at least 60 percent of the disturbed area is covered with the prescribed vegetation." Stabilization in terms of reclamation generally is considered a goal and may include revegetating disturbed areas to achieve a diverse native plant community, control soil erosion, control invasive non-native plants and noxious weeds, and establish wildlife habitat or forage production. A 60 percent vegetation cover is the short-term goal for disturbed areas throughout the planning area. The goal is to set the course for natural processes to achieve ecosystem restoration. For impacts on barren lands and other low cover types, this goal may be adjusted in the reclamation plan.

C-3: The DSEIS should define the differences between early successional species and early seral stage species. It should specify whether species referred to as early successional will be native or introduced and, if native, what characteristics separate early successional from early seral stage species. Alternatively, the DSEIS should use only the term "seral stage species" and delete the reference to successional species.

R-3: This sentence has been revised in the FSEIS as "...and the use of early and late seral stage native species for revegetation" to provide more clarity. Early and late seral can be interchanged with early and late successional. Seral stage plant communities are those where one of a series of plant communities follows another in time within a given area. They consist of a mix of trees and shrubs.

C-4: Page 2-12 includes the following statement: "Additionally, during reclamation activities, early succession plants would be used for revegetation to provide quick cover before noxious weeds can take root." The DSEIS should specify whether the early succession plants used would be introduced or native species. Many early succession plant species are considered weed species.

R-4: This sentence has been revised in the FSEIS to reflect the use of native and non-native early succession plants and sterile cover crops.

C-5: Page 3-108 includes the following statement: "Important shrubs include several species of sagebrush (*Artemisia nova, A. tridentata, A. vaseyana, A. cana*, and *A. wyomingensis*). Other important shrub species in this category are bitterbrush (Purshia tridentata), creeping juniper (*Juniperus horizontalis*), greasewood (Sarcobatus spp.), mountain mahogany (Cercocarpus spp.), rabbitbrush (*Chrysothamnus* spp.), and shadscale (*Atriplex canescens*)." Several of these species are misnamed. The DSEIS should be modified to state, "several species of sagebrush (*Artemisia nova, A. tridentata* ssp. *tridentata, A. tridentata* ssp. *vaseyana, A. cana*, and *A. tridentata* ssp. *wyomingensis*)" and either "shadscale (*Atriplex confertifolia*)" or "fourwing saltbush (*Atriplex canescens*)."

R-5: The species names used in the DSEIS are those that are used in the Montana Land Cover Atlas, The Montana Gap Analysis Project, which was the land classification system used for the EIS. The FSEIS has been updated to read "several species of sagebrush (*Artemisia nova, A. tridentata* ssp. *tridentata, A.*

tridentata ssp. *vaseyana*, *A. cana*, and *A. tridentata* ssp. *wyomingensis*).” The FSEIS has also been revised to read “and shadscale (*Atriplex confertifolia*) or fourwing saltbush (*Atriplex canescens*).”

C-6: On page 3-108, the paragraph under Other Wetlands should provide scientific names for species or genera not previously discussed.

R-6: The FSEIS includes the scientific names for these and other common names on page 3-108. The scientific names are included in the Vegetation Appendix.

C-7: Page 4-233 includes the following statement: “When shrub and forest sites are impacted, there would be a loss of structure and diversity of vegetation using the current seeding mix.” This sentence should be deleted. The loss of structure and diversity of vegetation occurred at the time of the initial disturbance and is not the result of the seeding mix.

R-7: The referenced sentence in the SEIS is accurate. While the loss of vegetative structure and diversity is the result of the disturbance, that structure and diversity is not restored using the current seeding mix.

C-8: Page 4-230 includes the following statement: “MBOGC policies require the operators to minimize the size of the drilling pads and require complete restoration of the area once operations are complete” (Administrative Rules of Montana [ARM] 36.22). The ARM is more specific as to what is required to restore disturbed sites. Revise to state “and require the restoration of the area to its previous grade and productive capability once operations are complete” (ARM 36.22).

R-8: State regulations are subject to change and modification and are considered to be outside of federal actions.

C-9: Page 4-232 includes the following statement: “Indirect impacts, such as noxious weed invasion, erosion, reduced plant species diversity following reclamation, or lack of successful reclamation could also cause vegetation loss.” Reduced plant species diversity following reclamation and a lack of successful reclamation should be deleted from this list. The loss of vegetation occurred because of initial disturbance. Reclamation attempts to restore vegetation. If diversity following reclamation is lower than before disturbance, or if reclamation is unsuccessful, no vegetation loss has occurred in addition to the initial disturbance.

R-9: The sentence has been revised in the FSEIS to read, “Impacts, such as noxious weed invasion, prescribed reseeding mix and erosion, could result in loss of desirable vegetation.”

C-10: Page 4-233 includes the following statement: “... indirect impacts would include the effects of erosion, changes in wildlife and livestock distribution, unsuccessful reclamation, riparian community changes, and the spread of noxious weeds.” Riparian community changes do not have an indirect impact on vegetation communities and should be deleted from this list. The release of produced water into surface water can cause riparian community changes. The method of disposing of water should be listed as an impact on vegetation communities, rather than the resulting changes.

R-10: The sentence has been revised in the FSEIS to “... indirect impacts would include the effects of erosion, changes in wildlife and livestock distribution, riparian vegetation community changes, and the spread of noxious weeds.”

C-11: Page 4-233 includes the following statement: “Failure to adequately restore these acres to predisturbance conditions would result in a loss of native habitat.” Delete this sentence. The loss of native habitat has already occurred during initial disturbance. Reclamation attempts to restore vegetation and habitats, and no additional losses occur if restoration fails.

R-11: The failure to restore acres to pre-disturbance conditions would result in a long-term loss of native habitat.

C-12: Pages 4-237 and 4-241 include the following statement: "More roadways provide greater access and more potential for disturbance, poaching, or harassing of protected species." Poaching and harassing do not apply to plant species and should be removed from these statements.

R-12: The FSEIS has been revised to read “More roadways provide greater access and more potential for disturbance of protected species.”

C-13: Page 4-238 includes the following statement: "Salinity can have long-term effects on vegetation, including death of riparian vegetation and concentrations of salt in riparian soils." Death of all riparian vegetation will not occur. Replace with "including a change in riparian vegetation to more salt tolerant species and. ..."

R-13: The sentence has been revised in the FSEIS to: "Salinity can have long-term effects on vegetation, including changes in species composition to more

salt-tolerant species, and high concentrations of salt in riparian soils."

Visual Resource Management

Comment 1 (C-1): The SEIS includes the following statement on page 4-244: "Four thousand acres of surface mining expansion under permit consideration may be approved this year. This mining activity may affect some visual resources in those areas for the next 20-30 years." The affected area covers far more than the 4,000 acres physically being mined. For example, Rosebud Battlefield State Park is 3,052 acres, but the viewshed is estimated to be about 11,000 acres (noted ACEC identified by MFWP and BLM archeologist in the 1990s). Much of the study area has topography similar to this state park or perhaps more level, extending the visual impacts of estimated surface mining to perhaps 14,400 acres. The visual effects of clearing operations for access road construction, site construction, drill rig operations, and on-site generator use will change the landscape line, form, color, and texture. These changes in aesthetics will alter the traditional use and ability of people to understand the events that took place on these lands. Many of these sites, similar to Rosebud Battlefield, have been preserved by private owners and agencies for 130 years. Mineral development could potentially destroy these assets in less than 5 years, with the impacts visible for 20 to 30 years.

Response 1 (R-1): BLM mitigates effects to visual resources for site-specific proposals. See the Visual Resource Management and Recreation sections of Chapter 4.

Wildlife

Comment 1 (C-1): An alternative should be developed that protects Montana's natural values, especially sensitive habitat for grizzly bears and other wildlife. There is no analysis of the road impacts or human-grizzly bear conflict on the survival and recovery of the species. BLM must provide an analysis using the best commercial and scientific data available on possible impacts to grizzlies and means to mitigate those impacts.

Response 1 (R-1): Alternatives B, E, and H include elements to protect natural resources within the Planning Area. Approximately 550 acres of BLM-administered estate occur within the occupied grizzly bear habitat. Therefore, limited impacts would be expected for grizzly bears. The BLM's Biological Assessment to the FWS states "Garbage and other human refuse would be removed from drilling and construction sites on a daily basis in potential bear habitat to avoid attracting bears. Surveys for scat and other sign of grizzly bears in remote, sparsely roaded areas would be conducted prior to construction. If found, protocol would be established after consultation with FWS biologists." If a plan of development is submitted within grizzly bear habitat, specific conservation measures or protocols would be developed to provide additional protections.

C2: Table 1-1 indicates that the FWS's authority includes the Endangered Species Act. For clarification, FWS also provides recommendations for protective measures for migratory birds in accord with the Migratory Bird Treaty Act, *Bald and Golden Eagle Protection Act, Executive Orders 11990 and 11988, CWA, Fish and Wildlife Coordination Act, and Fish and Wildlife Act.

R-2: The FSEIS has been modified to include the recommended language in Table 1-1.

C-3: Alternative H does not provide the same level of protection to crucial sage-grouse habitat as a no-development alternative. There are time lags of three to four years involved with sage-grouse population response to oil and gas extraction. This would allow significant impacts to occur before adaptive management has a chance to work. The pace of development must be slow enough to allow for monitoring to detect sage-grouse population level response before additional disturbances are allowed.

R-3: Management of sage grouse habitat has been modified. See Chapter 2, Alternative H under the Wildlife Screen.

C-4: The 20 percent surface disturbance over 20 years (20/20) rule does not provide added protection for sage-grouse.

R-4: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-5: The large amount of produced water extracted during CBNG extraction tends to create the right habitat constituents for Culex mosquitoes; therefore, CBNG development is likely to increase the incidence of West Nile virus outbreaks among sage-grouse. Any mosquito abatement program should not preclude use of created wetlands by other native species.

R-5: The SEIS acknowledges that CBNG production could result in increased risk of West Nile virus due to creation of holding ponds that could increase mosquito populations. The Wildlife Monitoring and Protection Plan (WMPP) was revised to include clarification that larvacides are used only in created holding ponds; are as environmentally sensitive as possible; do not accumulate in the air, soil, or water of a treatment site; and are not harmful to non-target insects. Measures to minimize mosquito populations in CBNG ponds are included in the WMPP. These BMPs are also being used on other water developments. The listing of these BMPs within the WMPP does not preclude use of other acceptable measures that would prove an effective element of a mosquito abatement program.

C-6: Full-field CBNG in the past has been detrimental and likely incompatible with maintenance of sage-grouse populations, and it is unknown what level of development can be withstood by sage-grouse. Loss of the Powder River Basin sage-grouse population could lead to demographic and genetic isolation of the northern population, making it more likely that this population would require listing under ESA. Sage-grouse mitigation measures need to address habitat on a large scale.

R-6: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-7: Oil and gas operations negatively affect sage-grouse in all seasons, making timing restrictions ineffective and necessitating mitigation measures that effectively address sage-grouse needs in all seasons. Current BLM mineral lease stipulations only address construction impacts on wildlife. Mitigation also has to address the operation phase.

R-7: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-8: Alternative H does not prevent adverse effects to sage-grouse within the identified crucial range. For adaptive management to prevent such impacts, the SEIS has to describe a process of monitoring and thresholds for guiding management decisions.

R-8: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-9: Identification of leks to be monitored both inside of crucial habitats and outside of crucial habitats (outside of oil and gas development). It should be completed so that determinations can be made as to the adequacy of sample sizes and appropriateness of reference (non-developed) areas.

R-9: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-10: Criteria have to be identified for monitoring data and thresholds for adaptive management actions.

R-10: Within the WMPP, under "Annual Reports and Meeting," protocol requires an annual meeting by the core team to discuss and modify, as necessary, proposed wildlife inventory, monitoring, and protection protocol for the subsequent year. See Monitoring Appendix.

C-11: BLM must identify mitigation circumstances (measures) that would allow for development if population is declining.

R-11: The wildlife screen under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-12: BLM should implement sage-grouse management elements described under Alternatives F or G which protect sage-grouse crucial range until it can be demonstrated that development can occur without displacing the population. Outside of crucial sage-grouse habitat, adaptive management from Alternative H, along with enhanced BMPs, should be used to maintain habitat connectivity.

R-12: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-13: Other sagebrush-dependent species may also be negatively affected by CBNG development in the Powder River Basin. Behavioral avoidance of roads indicates that the effects of project roads in oil and gas developments extend far from the roadbeds themselves and may negatively affect migratory bird populations. These sensitive bird species would benefit from a conservative approach to oil and gas development.

R-13: Chapter 4 of the SEIS acknowledges the preferred alternative will have negative effects on sagebrush-dependent species. BLM acknowledges the likelihood of impacts to some wildlife species, even with the use of BMPs, etc. Direct and indirect road-related impacts on wildlife are discussed under Alternative A. Chapter 2, Alternative H, discusses protection measures for crucial habitats, including

songbirds. In addition, elements of Alternative H specific to sage-grouse would offer additional protections for sagebrush-obligate species using similar habitats.

C-14: FWS supports BLM in its continued efforts to manage habitat for the bald eagle if the species is delisted, as well as the monitoring outlined in the WMPP. FWS encourages BLM to modify the monitoring plan as needed to address changing management needs for the species. Instead of continuing winter roost surveys on an annual basis, FWS recommends that roost surveys occur only at times and in years where severe winter conditions make roosting concentrations likely and that surveys occur at most every other year. FWS further recommends that BLM consider the entire wooded corridor of rivers used by wintering bald eagles be considered by BLM during project planning as high bald eagle use areas and protect them accordingly.

R-14: The WMPP was revised to reflect FWS recommendations for monitoring. Currently, development is not allowed within 0.50 miles of bald eagle nesting habitat within riparian areas. However, additional conservation measures could be added at the POD level for specific projects based on localized habitat conditions or adaptive management. For roads and infrastructure, the operator will be required to demonstrate in the Project POD how proposed roads and infrastructure would mitigate or minimize impacts to affected wildlife, including bald eagles.

C-15: FWS supports the management of black-footed ferret habitat outlined in the WMPP. FWS should be notified before conducting surveys on prairie dog towns over 80 acres so that the need for such surveys can be addressed before resources are expended.

R-15: The WMPP was modified to indicate BLM will notify and coordinate with FWS before conducting surveys on prairie dog complexes over 80 acres.

C-16: FWS recommends no surface use or disturbance on prairie dog towns. Roads and infrastructure should be placed away from prairie dog towns when possible. BLM does not have to permit destruction of suitable prairie dog and mountain plover habitat simply because the agency does not own the surface estate. All prairie dog colonies, regardless of presence, absence, or suitability for either mountain plovers or black-footed ferrets, should be, at minimum, managed under no-surface-occupancy stipulations for oil and gas development and should also be excluded with a 0.25-mile buffer.

R-16: BLM oil and gas leasing decisions and lease stipulations, including those applicable to CBNG, were previously analyzed in the BLM 1992 Final Oil and Gas RMP/EIS Amendment. Those decisions were approved in the project's Record of Decision published in February 1994. Analyzing new or modified lease stipulations are therefore beyond the scope of this SEIS. However, additional conservation measures could be added at the POD level for specific projects based on localized habitat conditions or adaptive management. For roads and infrastructure, the operator will be required to demonstrate in the Project POD how proposed roads and infrastructure would mitigate or minimize impacts to affected wildlife, including prairie dogs.

C-17: With respect to restrictions contained in the wildlife screen, is it legal to restrain development until research is completed?

R-17: The management policy for sensitive species requires that BLM manage sage-grouse so as not to contribute to the species being listed under ESA. Much research has been completed with respect to sage-grouse and other wildlife within the Planning Area, and additional research is expected to continue. The concept of adaptive management allows for alterations based on new data, and this additional research will add to the knowledge base and help guide future decisions. Given recent research, BLM has elected to modify the Preferred Alternative for sage-grouse habitat management in Alternative H. See Chapter 2, Alternative H.

C-18: What is the basis for the statement "In general, suitable long-term sage-grouse habitat must contain a minimum of 1,000 contiguous acres of sagebrush and (be) located a minimum of 400 meters from visible conifers?"

R-18: Suitable long-term, sage-grouse habitat was based on professional research, including GIS analyses that indicated grouse select habitat based on the amount of sagebrush habitat at the 1,000-meter scale and a minimum of 400 meters from visible conifers (Naugle 2006 [June 24]).

C-19: While negative effects on sagebrush obligate species are likely, such disruption of sagebrush habitats will have positive effects on wildlife species that require more open or mixed sagebrush/herbaceous habitats. The prey base, which is known to limit raptor populations (Grant et al. 1991), is likely to be increased with the opening up of the sagebrush habitat.

R-19: See changes to Preferred Alternative H, wildlife screen, for management of sage-grouse

habitat. Chapter 4, Wildlife, Alternative H, now discusses how species more closely associated with grassland habitats may become more common in some areas as sagebrush-obligate species decline (Knick et al. 2003). During the construction and production phases of the development, however, removed sagebrush habitat will be replaced by facilities and associated human disturbance and may compromise effective wildlife habitat until restoration to pre-disturbance conditions occurs.

C-20: "Restrict noise levels from production facilities to 49 decibels (dBA) (10 dBA above background noise at the lek)" (Page WMPP-13). It is not clear whether noise levels at all production facilities must be restricted to 49 dBA, or only those within a certain distance of an active lek. Also, there are no empirical data supporting this requirement.

R-20: Noise levels at all production facilities must be limited to 50 dBA. WDFG (2005) indicates that to avoid disrupting auditory displays, from March 1 through May 15, anthropogenic sources of continuous or frequently intermittent noise should not exceed 10 dBA above natural, ambient noise measured at the perimeter of any occupied sage-grouse lek. From April 1 through June 30, reduce noise levels to 49 dBA or less within Status 1-3 songbird breeding habitat to minimize the effects of continuous noise on species that rely on aural cues for successful breeding (Inglefinger 2001).

C-21: Tall sagebrush stands represent severe winter relief habitats and have to be identified to prevent protecting overly large areas. During severe winters of prolonged deep snow, there are only a few areas where sagebrush is tall enough to remain available to sage-grouse above the snow. These areas, termed severe winter relief habitats in a study conducted by Hayden-Wing Associates and the Rawlins Office of BLM, are described in "Vegetation and Habitat Analysis of Critical Wintering Areas for Greater Sage-Grouse" (July 2006). These severe winter relief habitats must be identified as soon as possible to avoid the unnecessary protection of large areas of winter habitat that are not critical to sage-grouse survival.

R-21: Although winter range may not always be a limiting factor in sage-grouse populations—birds may be spread out over large areas during mild winters but clumped in less than 10 percent of the available habitat in severe winters (Beck 1977). Winter range does play an important role in population dynamics (Connelly et al. 2003). In Montana, protection of winter sagebrush habitat was reported to be important due to increased hen mortality during severe winters (Moynahan et al. 2006). In Idaho, grouse adapted to loss of dense sagebrush winter range by moving 1 to 10 km to areas with greater sagebrush cover (Robertson 1991), thus demonstrating the importance of large blocks of habitat. Delineation of crucial winter range involves several factors, one of which will be presence of large blocks of tall sagebrush. Shorter sagebrush in areas where snow does not accumulate can also be important. In Colorado, Hupp and Braun (1989) recommend sagebrush be maintained in drainages and on slopes with south or west aspects because, during winters with deep snow cover, these areas would be most likely to have exposed sagebrush available for sage-grouse. Sage-grouse in the SEIS area are considered to be essentially non-migratory, meaning important seasonal habitats are one and the same or in close proximity to one another. In some areas, these crucial habitats have been identified. In areas where these crucial habitats have not been identified, they will be prior to APD approval.

C-22: Existing stipulations that restrict surface occupancy within 0.4 km (0.25 mile) of an active lek are insufficient to maintain populations within developed oil and gas fields. Current well spacing of 32 to 64 hectares (80 to 160 acres) appear to be several times greater than breeding sage-grouse populations can tolerate. We support using a minimum 1.6-km (1-mile) buffer of no surface occupancy around existing leks and preferably, use a minimum 3-km (1.8-mile) buffer recognizing that development activities within 3 km will have negative impacts on sage-grouse populations. Further, it is recommended that a 6.9-km (4-mile) buffer around leks be used to protect nesting and brood rearing habitat for a minimum of 70 percent of the nesting hens associated with a lek from March 1 through June 30. This protection should apply to both initial development and subsequent annual development and maintenance operations.

R-22: This is not a document where stipulations are being added. Our approach focuses on maintaining the functionality of crucial areas and minimizing disturbance in other habitats. BLM will use monitoring data and the wildlife screen within the preferred alternative to guide it in the protection of crucial habitat. Should data indicate the need to implement the suggested setbacks and restrictions, BLM would use Conditions of Approval and revisions to PODs to protect crucial habitat.

C-23: The DSEIS fails to adequately analyze how using CBNG-produced water for livestock will change distribution across these landscapes, as well

as the impacts that may result to vegetation and wildlife. More surface water very likely will result in additional fencing to manage livestock distribution; the effects of such additional fencing on sage-grouse and other wildlife are also not adequately analyzed in the DSEIS. BLM, in addition to stronger in-field stipulations, could propose extensive off-site mitigation where sage-grouse habitat quality is optimized through state-of-the-art livestock allotment management, herd buy-downs, or other long-term dedication to shrub-steppe habitat conservation.

R-23: The effects of produced water are discussed in the Livestock Grazing, Vegetation, and Wildlife sections of Chapter 4. Project-specific analyses and mitigation regarding how produced water will be handled will be evaluated in the NEPA document at the ADP/POD level.

C-24: CBNG development will further fragment prairie dog habitat, making recolonization and long-term persistence more unlikely. The FSEIS should include provisions to mitigate for adverse impacts on prairie dog colonies through establishment of large complexes of prairie dog towns on BLM-administered lands unaffected by CBNG development.

R-24: As stated in the WMPP, project activity will be located to avoid impacts to prairie dog colonies determined suitable as black-footed ferret habitat.. Also, Table MIN-5 includes a mitigation measure to survey prairie dog colonies and complexes 80 acres or larger to determine the presence or absence of black-footed ferrets. The findings of this examination may result in some restrictions to operators' plans. There are no plans to consider establishment of new prairie dog towns.

C-25: Will the Tongue River Railroad cumulatively impact sage-grouse? There are no WMPP measures for sage-grouse except a 0.25-mile NSO and 2-mile April 1 to June 30 avoidance (WMPP-17, Table 2). Does this mean the railroad will not run in the spring if it passes within 2 miles of a sage-grouse lek?

R-25: The cumulative effects to sage-grouse are found in Chapter 4 under the heading of Conclusions for Alternative H. While BLM must consider and disclose these effects, BLM does not have the ability to apply protective measures to the TRR.

C-26: The DEIS and DSEIS fail to adequately analyze how new roads will influence vulnerability of formerly inaccessible wildlife to hunter harvest.

R-26: Direct and indirect road-related impacts on wildlife are discussed within the Recreation and Wildlife sections of Chapter 4 under the heading of Alternative A and apply to all alternatives. These include impacts from increased recreational use (including hunting).

C-27: This DSEIS does not provide any certainty that sage-grouse populations will be sustained in eastern Montana and northern Wyoming over the long term. BLM must set aside adequate areas of breeding, winter, and seasonal habitats to sustain large intact sage-grouse populations. A population goal for maintenance of sage-grouse in the Powder River Basin should be established and actions taken to achieve that goal by rigorous designation of critical habitat as is done for listed species.

R-27: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2. The SEIS includes maps of known habitats likely to be important for sage-grouse and sets objectives for those habitats. The SEIS also discloses that efforts to identify additional important habitat will continue to work with MFWP, the state agency responsible for managing sage-grouse populations, to understand population goals. Designation of Critical Habitat is a requirement under the Endangered Species Act and does not apply to non-listed species.

C-28: BLM should map crucial mule deer habitat.

R-28: A map has been included in the FSEIS within the Wildlife section of Chapter 3.

C-29: Impacts on pronghorns should be analyzed and a plan developed to prevent or minimize losses.

R-29: Impacts from various CBNG-related activities, including roads and other infrastructure, are discussed in the Wildlife section of Chapter 4. Since the SEIS is programmatic, quantities and locations of site-specific impacts from development are not known with respect to existing pronghorn populations or habitat. Existing oil and gas lease stipulations and provisions within the SEIS include protective measures for big game species, including pronghorns.

C-30: Development should also include taking all measures to reduce the potential of CBNG ponds to produce late summer mosquito populations that infect sage-grouse with West Nile Virus.

R-30: Monitoring will tell BLM what protective measures need to be added, removed or modified. See the WMPP protective measures under Sage and Sharp-tail grouse, Control of West Nile Virus.

C-31: The DSEIS again offers no baseline data in its analysis of wildlife impacts, specifically, data or

information on current population numbers, trends, geographic distribution, or any quantifiable information on the amount and quality of existing habitat is not presented for a single species of wildlife to serve as a basis for design of alternatives. Additionally, the list of species of concern/sensitive presented in Table WIL-1 does not seem to match the list of sensitive species from the Montana Natural Heritage Program.

R-31: The Wildlife section of Chapter 3 includes the most recent information available regarding relevant wildlife species populations and trends at the time the document was prepared. Crucial habitats for big game and sage-grouse have been identified across the planning area, based on MFWP and BLM data. Potential crucial habitats for other species will be analyzed continually throughout the planning process. Crucial habitats were integrated as part of the design criteria for alternatives. A map showing crucial big game habitat areas within the PRB has been added to the FSEIS within the Wildlife section of Chapter 3. BLM and MFWP are and will continue to collect baseline and monitoring data for selected species of wildlife.

The potential for project-related CBNG activities to have an impact on these species and their habitat is presented within the Wildlife section of Chapter 4. The species listed on Table WIL-1 are those which have been identified as being present within the Planning Area. Not all of the species of concern listed by the Natural Heritage Program would be present within the Planning Area. The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-32: BMPs are voluntary, and BLM should be working with CBNG operators and surface owners regarding their voluntary implementation in crucial sage-grouse habitat areas where the species is present. The DSEIS does not acknowledge the surface owner's role in sage-grouse habitat protection.

R-32: BLM encourages all energy companies to develop and add BMPs into all of their drilling proposals. Because BMPs are so important for protecting the resources we manage as stewards of the public lands, the BLM can and will require energy companies to use appropriate BMPs, through the use of conditions of approval if determined necessary as part of the POD review.

C-33: The displacement criteria for sage-grouse are inconsistent. On page 2-21, the DSEIS provides that no displacement can occur. This provision should be deleted. On page 2-26; the DSEIS provides that monitoring should take place to "ensure development is not displacing sage-grouse to the point that a sustainable population is not maintained."

R-33: The language on page 2-21 of the DSEIS states that displacement of sage-grouse from crucial habitat areas should be avoided. This is consistent with the language as noted on page 2-26 of the DSEIS. The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-34: The DSEIS does not reference the report, "Greater Sage-Grouse Lek Counts (2000-2006) in and around Fidelity Exploration & Production Company's Coalbed Natural Gas Development Areas in Big Horn County, Montana and Sheridan County, Wyoming," prepared by Hayden-Wing Associates and dated September 2006. The DSEIS should also include the recent data collected by the Wyoming Game and Fish Commission on sage-grouse populations in Wyoming. Sage-grouse should be listed under "Upland Game Birds" instead of under "State Species of Special Concern." The DSEIS does not advise the reader that the sage-grouse is a game bird. The DSEIS should also discuss sage-grouse observations that have been documented at the Cedar Creek Anticline.

R-34: The DSEIS included information available at the time the document was prepared; the referenced document was not available before the DSEIS went to print. Sage-grouse is included as an Upland Game Bird species within the Wildlife section of Chapter 3; however, it is also a State Species of Special Concern. BLM included consideration of region-wide sage-grouse data in the SEIS and in formulation of the wildlife screen under the Preferred Alternative, Alternative H, but did not include data specific to the Cedar Creek Anticline as it is outside of the Planning Area. The Preferred Alternative for sage-grouse habitat management has been modified in Alternative H. See Chapter 2, Wildlife section.

C-35: Do any of the studies mentioned include non-CBNG reservoirs or impoundments? The DSEIS does not provide a discussion of the region-wide West Nile Virus epidemic in Wyoming, Colorado, Montana, and Idaho (non-CBNG).

R-35: A regional discussion of the effect that West Nile Virus has had on sage-grouse is presented within the Wildlife section of Chapter 3 under the heading of West Nile Virus. The data presented are, in part, for four radio-marked populations of sage-grouse in Wyoming, Montana, and Canada.

C-36: Page 3-123 includes the following statement: "In 2006, Naugle utilizing satellite imagery identified priority habitats for sage-grouse in the PRB. This information identified areas of high value sage-grouse habitat. This mapping utilized several components including, roughness, sagebrush coverage (height/abundance), and distance from conifers. In general, suitable long term sage-grouse habitat must contain a minimum of 1000 contiguous acres of sage brush and located a minimum of 400 meters from visible conifers." The DSEIS fails to advise the reader of the accuracy of the satellite imagery used and that the data have not been ground-truthed. The DSEIS should address what other quantitative parameters were factored into the formulation of this conclusion.

R-36: The FSEIS was revised to describe criteria for the mapping data sources. Doherty et al. (2007 in press) found that sage-grouse selected winter sites that had a greater than 75 percent sagebrush cover in a 4-square-km area. Some areas have been ground truthed.

C-37: Page 3-123 includes the following statement: "Much of the recent research conducted by Holloran and Naugle, et al. focuses on the impact of CBNG development on male sage-grouse attendance on strutting grounds." Holloran did not do any research on CBNG development. Matt Holloran's research was in southwest Wyoming and mainly focused on natural gas development in the Jonah Field and the Pinedale Anticline.

R-37: The FSEIS has been revised to clarify where Holloran's research was conducted.

C-38: The DSEIS does not include the sage-grouse data that were collected for the Fidelity Exploration & Production Company, Montana 2002-2003 Drilling Area, Baseline Wildlife Inventory or for the Fidelity Exploration & Production Company, Proposed Coal Creek POD, Big Horn County, Baseline Wildlife Inventory.

R-38: The referenced data, as well as data from other sources, were considered in the development of the DSEIS. The referenced documents are summarized within the Wildlife section of Chapter 3 under the heading of Wildlife Surveys and Monitoring Since the Statewide Document and are included as references within the Bibliography.

C-39: The Montana Board of Oil and Gas Conservation does not have statutory authority to apply sage-grouse protection standards to APDs. BMPs are to be voluntary and not mandatory. Does BLM have data that show habitat connectivity exists today? The section on sage-grouse habitat (page 2-21) is poorly defined. The section does not specify how BLM will maintain the connectivity of sage-grouse habitat and allow for genetic diversity and repopulation. At this stage, BLM is committing to work with operators, landowners, FWS, and Montana Fish, Wildlife and Parks to identify BMPs and alternate development schemes, yet the result will be restricting the pace of development in crucial habitat areas.

R-39: MBOGC conducts environmental reviews and issues drilling permits for all private, state, and most federal lands (excluding proposals on allotted or tribal minerals). To provide for the mitigation of potential effects to sage-grouse within the Planning Area, BLM will work with the MBOGC to incorporate and encourage the use of BMPs for CBNG development on state and private lands. The BMPs would be used, as appropriate, in CBNG development and would be included as part of approved PODs. With respect to sage-grouse connectivity, a discussion of sage-grouse distribution is included in the Wildlife section of Chapter 3 under the heading of Sage-grouse Distribution, Habitat Needs, and Population Dynamics. Additionally, Map 3-12 shows sage-grouse distribution and connectivity within the Planning Area, while Map 3-14 shows sage-grouse distribution and connectivity throughout Montana and Wyoming, as well as parts of North and South Dakota. Through the use of adaptive management and the implementation of BMPs, existing habitat and connectivity can be maintained. The commenter is correct in noting implementation of the provisions of the wildlife screen under the Preferred Alternative, Alternative H, would likely result in some CBNG development delays, particularly in areas where crucial habitat is present.

C-40: "The goal of the WMPP is to avoid or minimize impacts to wildlife and serve as a communication tool to foster cooperative relationships among the CBNG and conventional Oil and Gas industry (i.e., Operators), resource management agencies, landowners and adjacent Tribal Governments" (Wildlife Appendix, page WMPP-1). The goal of the WMPP should include the documentation of both beneficial and negative changes to the species that occur on project areas.

R-40: The WMPP has many functions; one would be to document changes, both positive and negative, to a species to guide ongoing and future actions. However, the goal of the WMPP is as stated, "…to avoid or minimize impacts to wildlife and serve as a communication tool…."

C-41: "Surface use is prohibited between April 1 - June 30 in grouse nesting habitat within 2 miles of a known lek." (Wildlife Appendix, page WMPP-8). BLM is proposing to shift and expand the timing limitation stipulation from March 1 to June 15. What is the basis for such change?

R-41: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified; see Alternative H within Chapter 2. See the Wildlife Appendix for proposed changes with respect to surface use near a lek.

C-42: "Manage produced water to reduce the spread of West Nile virus within sage-grouse habitat areas. Implement the following impoundment construction techniques to eliminate water sources that support breeding mosquitoes" (Wildlife Appendix, page WMPP-8). The goal to "eliminate water sources that support breeding mosquitoes" is unrealistic. There are several natural and man-made impoundments (excluding CBNG-produced water impoundments) that contain mosquito habitat. The techniques should be recommended, not mandated, practices. The construction of the CBNG-produced water impoundment should take into account the surface owner's needs and desires.

R-42: The WMPP includes measures aimed at reducing the impact of produced water on West Nile Virus. BLM would not eliminate all water sources, but would implement the use of stipulations to minimize the potential for CBNG impoundments to provide mosquito habitat. BLM would work with surface owners and the operators in meeting the needs of the surface owner where conditions allowed.

C-43: "Locate storage facilities, generators, and holding tanks outside the line of sight and sound of important sage-grouse breeding habitat" (Page WMPP -13). No empirical data support the requirement to locate storage facilities, generators, and holding tanks outside the line of sight and sound of important sage-grouse breeding habitat. Is "sage-grouse breeding habitat" the same as a sage-grouse lek? BLM already has a 0.25-mile, no-surface-occupancy stipulation protecting leks. Is this an additional stipulation that is being implemented through programmatic guidance?

R-43: The requirement is directly from the Montana State Sage Grouse Management Plan and Conservation Strategies (MSGWP 2005). The sage-grouse breeding habitat is essentially the same as the identified crucial sage-grouse habitats. The requirement for locating storage facilities, generators, and holding tanks outside the line of sight and sound of important sage-grouse breeding habitat is in addition to the 0.25-mile NSO stipulation for protecting leks.

The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2 and the Wildlife Appendix for proposed changes with respect to surface use near a lek.

C-44: Corridors undeveloped to allow for wildlife movement is a very good idea, but this is not phased development. In contrast, phased development to protect wildlife populations and habitat would have to concentrate on limiting the geographic and temporal scope of development in a given area in ways designed to leave enough habitat for species to coexist with development at each point in time during the life of the project, from drilling through extraction to reclamation.

R-44: BLM is aware there may be some crucial sage-grouse habitat irreversibly committed while monitoring and research are conducted to test the application of BMPs and identify new ones. The Preferred Alternative, Alternative H, has the objective of "maintaining the connectivity of sage-grouse habitat within the PRB and adjacent regions and maintenance of source populations for repopulation of areas from which displacement may have occurred due to CBNG development." Monitoring data will be used to develop and apply BMPs sufficient to protect sagebrush habitat and sage-grouse source populations.

C-45: Regarding the definition of surface disturbance in crucial habitat areas (page 2-21), BLM does not provide any references to substantiate the 200 meters on both sides of main roads as a direct disturbance. What data did BLM use to generate this definition? This stipulation does not provide flexibility in road use, such as during construction versus during the production phase. Also, BLM does not account for well maintenance activities, such as workovers or the pulling of pumps. BLM's statements about what wildlife will avoid and not avoid are not substantiated by any technical reference. Main arterial roads are not defined. It appears that BLM is trying to define arterial roads as roads that have a high traffic volume of 12 vehicles per day. Therefore, BLM would consider a road that has one vehicle every 2 hours during a 24 hour day a high-traffic road.

R-45: There are numerous documents referenced in the Wildlife section of Chapter 3 which discusses the impact of roads to wildlife. Research indicates some wildlife species are negatively impacted by roads,

regardless of the amount of use. The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-46: Regarding the adaptive management objectives listed on page 2-21, how is a CBNG operator going to prove that operation will maintain the connectivity of sage-grouse habitat within the PRB and adjacent regions? Adjacent regions are not identified. BLM is putting the burden on CBNG operators to prove a negative. How are we to prove that our operation will not cause a temporary displacement? Where are the data that show displacement as being detrimental to the species?

R-46: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2. Operators will need to follow the guidelines and requirements under Alternative H and management Common.

Literature has been cited documenting the adverse effects of temporary displacement of sage grouse.

C-47: The new sage-grouse crucial habitat restrictions are based upon a preliminary report from the University of Montana that has not been validated or peer-reviewed. It is irresponsible of BLM to implement such preliminary research when on-the-ground data (HWA Greater Sage-Grouse Lek Counts, 2000, 2006) in and around Fidelity Exploration & Production Company's Coalbed Natural Gas Development Areas in Big Horn County, Montana, and Sheridan County, Wyoming, show that sage-grouse are still using leks within Fidelity's development. Holding up CBNG development until the completion of research to identify crucial brood, rearing, and nesting habitat areas does not honor an oil and gas lessee's valid existing rights to explore and develop his leases.

R-47: Interim reports were used because they were the information available at the time the DSEIS was released; since that time, the University of Montana report referenced has been peer-reviewed. It is not BLM's intent to either delay or hold up CBNG development, but rather to provide a means for CBNG development to proceed without unacceptable impacts to wildlife habitat within the Planning Area. The agency recognizes some delay will likely occur within areas with crucial habitat. The Preferred Alternative for sage-grouse habitat management has been modified in Alternative H. See Chapters 2 and 4 under the Wildlife section.

C-48: The assumption in Alternative H that CBNG development is to blame for any reduction in wildlife populations without analyzing other causes, such as drought or severe winters, is not borne out by scientific data.

R-48: The potential for project-related, CBNG development activities to impact wildlife is detailed within the Wildlife section of Chapter 4. Additional discussion of the potential for other factors, such as drought, to impact wildlife populations is contained in the FSEIS within the Hydrological Resources and Wildlife sections of Chapter 3.

C-49: CBNG standard stipulations are clearly insufficient to prevent significant impacts to and ultimate depopulation of sage-grouse. Proposed well densities of 80 to 160 acres spacing should be expected to have heavy impacts on sage-grouse populations. BLM has not planned the location of wells and roads; the agency will not be able to analyze the direct and cumulative impacts of the project on sage-grouse, either on a project-wide basis or lek by lek.

R-49: Cumulative effects are assessed in the SEIS; see Chapter 4. Project-specific environmental assessments, as well as WMPPs, are required for each POD. All potential impacts, direct and cumulative, resulting from a specific project would be identified during the development of the project environmental assessment (EA).

C-50: What exactly does the BLM define as "within suitable mountain plover habitat?"

R-50: The WMPP, in the Wildlife Appendix, states that BLM, FWS, and MFWP will estimate potential mountain plover habitat to determine the presence/absence of potentially suitable mountain plover habitat. Additionally, within the Wildlife section of Chapter 3 under the heading of Mountain Plover it is stated that the mountain plover "prefers relatively flat sites with very short grass and scattered cactus." Intensive grazing is beneficial for mountain plovers, and mountain plovers also regularly occupy prairie dog towns. High, arid plains and shortgrass prairie with blue grama-buffalo grass communities are the primary habitat.

C-51: BLM should undertake a detailed analysis of burrowing owl population numbers and trends in the Powder River Basin and thoroughly analyze the impact of the proposed plan amendment's various alternatives on burrowing owl population viability.

R-51: Raptor surveys conducted from 2002 to 2005 in proposed CBNG drilling and pipeline development areas in Big Horn and Powder River counties

documented active burrowing owl nesting areas (see the Wildlife section of Chapter 3 under the heading of Wildlife Surveys and Monitoring Since the Statewide Document). BLM will continue to update burrowing owl population data as surveys are conducted and will incorporate the information into the WMPP.

C-52: BLM should undertake a detailed analysis of swift fox population numbers and trends on the Powder River Basin and thoroughly analyze the impact of the proposed plan amendment's various alternatives on swift fox population viability.

R-52: The swift fox is discussed within the Native Americans Concern section of Chapter 3 under the heading of Wildlife which states that the swift fox was "removed as a Candidate Species for Threatened Status by the FWS on January 8, 2001. Their numbers are believed to be stable, but there is still concern for their future." BLM does not believe that additional surveys are warranted at this time. Should additional data become available, then BLM would reconsider the need for swift fox surveys.

C-53: Potential black footed ferret recovery areas should be ACECs.

R-53: In order to consider this for an ACEC, additional planning must occur.

C-54: Because prairie dogs are already stressed by endemic or epidemic levels of sylvatic plague, stronger conservation measures are needed to prevent impacts from activities that can, in fact, be controlled. This analysis has not been attempted by BLM, in violation of NEPA.

R-54: BLM recognizes the potential for plague to impact prairie dog populations. The WMPP, included within the Wildlife Appendix, states the following: "Prairie dog towns on BLM lands within 0.5 miles of a specific project area will be identified, mapped and surveyed…." In addition, reference prairie dog colonies subject to development will be identified. On an annual basis, BLM and/or a BLM-approved, operator-financed biologist will survey, at least a portion of, the prairie dog colonies, including the reference colonies. Prairie dog populations may be subject to population fluctuations primarily due to disease (plague). Therefore, efforts will be made to compare the data from the reference colonies with that obtained from the project areas, in order to monitor the response of prairie dog population to CBNG development.

C-55: The actual road avoidance zone for deer is much larger than 200 meters, and elk have been found to avoid areas within 0.6 to 1.2 miles from a road as a result of vehicle-related disturbance (Powell 2003; Sawyer and Neilson 2005).

R-55: The 200 meter road requirement has changed. See Chapter 2, Alternative H, Wildlife Screen. One of the wildlife objectives is to protect wildlife species that rely seasonally or yearlong on crucial habitats.

C-56: Several studies have shown that elk abandon calving and winter ranges in response to oil field development. Thus, winter range areas should be withdrawn from the surface disturbances associated with oil and gas development, and leased only under no-surface-occupancy stipulations.

R-56: A map has been added to the FSEIS showing winter habitat within the Planning Area for deer, antelope, and elk. BLM will work with MFWP to gather additional data and further refine protection measures as necessary within any of these potential areas. The SEIS is not a leasing document (see Chapter 2, "Alternatives Considered but not Analyzed in Detail, "Leasing" for further discussion.)

C-57: How much of the landscape will be within 100 meters of a road or well pad under each alternative resulting in habitat function losses for migratory birds?

R-57: A discussion of the potential impacts to migratory birds resulting from project-related CBNG activities is contained within the Wildlife section of Chapter 4 under the heading of Alternative A. Not all roads or well pads within the Planning area would be constructed within suitable habitat for migratory birds; therefore, a discussion of the number of acres within 100 m of a road or well pad would not provide usable data for assessing potential impacts. Project specific environmental assessments and wildlife monitoring and protection plans are required for each POD. Should an environmental assessment identify the potential for project-related activities to impact sensitive habitat for migratory birds, then measures to mitigate the potential impacts to that habitat would be outlined in the wildlife monitoring and protection plan.

C-58: BLM fails to provide baseline information about the size of the present mountain plover population and also fails to predict the population trend as a result of the project. Recent studies have documented mountain plover population extinction with oil and gas development in Utah.

R-58: There are limited data available to quantify the population of mountain plovers in the Project Area. BLM has conducted mountain plover surveys in various locations as described in the DSEIS, within the Wildlife section of Chapter 3 under the heading

of Mountain Plover, and has not found any mountain plovers.

C-59: Simply listing and not analyzing the effectiveness of mountain plover mitigation measures results in violation of NEPA. BLM has failed to provide any support or analysis of the effectiveness of seasonal mitigation measures for wildlife, including big game, despite its obligations under NEPA.

R-59: Mitigation measures for mountain plover consist of surveying development areas for potential nesting sites and avoiding construction and exploration activities in any identified nesting areas during the nesting period from May 1 through June 15 to ensure potential nesting mountain plovers are not prevented from setting up territories as a result of the presence of equipment and humans. A discussion of mountain plover mitigation measures, including the rational for the mitigation measure, is included in the Wildlife section of Chapter 4 under the heading of Alternative A, Mountain Plover. The effectiveness of mitigation measures, including seasonal mitigation measures, in avoiding or minimizing impacts is discussed under the heading of Conclusions for each alternative within Chapter 4. Additionally, using adaptive management techniques, as outlined in the Preferred Alternative, Alternative H, would allow for monitoring and adjustment of existing and new mitigation measures to ensure they provide some level of protection of wildlife and wildlife habitat.

C-60: Mitigation measures must use a buffer size adequate to result in only minor impacts.

R-60: The buffers proposed are appropriate for maintaining wildlife and wildlife habitat. BLM would evaluate new data as it becomes available, or new data developed through the use of adaptive management, that show the need for adjusting a buffer to better protect wildlife or wildlife habitat. BLM would then adjust the buffer accordingly.

C-61: Potentially disruptive activities that occur in sensitive habitats after construction and drilling are completed negate the mitigation value of seasonal restrictions as proposed by BLM.

R-61: The WMPP includes seasonal restrictions developed through consultation with MFWP and FWS. While not eliminating all adverse impacts that could occur, the seasonal restrictions do reduce the level of impact during the most crucial time periods. As stated in the WMPP, additional conservation measures will be incorporated through the Project Plan design or as conditions of approval. When reviewing PODs, BLM will use currently available information regarding effects of CBNG development to develop additional protective measures where appropriate.

C-62: A reasonable alternative would be to place a moratorium on the construction of wells, roads, and other infrastructure for the important nesting habitat that occurs within 3 miles of a sage-grouse lek, or within 1 mile of a sharp-tailed grouse lek.

R-62: The Wildlife Screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2. No development in crucial habitat was analyzed in Alternative F and H. the assumption used for the analysis ranged from no development to full field development.

C-63: Oil and gas development poses perhaps the greatest threat to sage-grouse viability in the region. Dr. Braun's Blueprint for Sage-grouse Conservation and Recovery should be implemented in the context of the Montana Powder River Basin CBNG SEIS process.

R-63: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-64: There has been no disclosure or analysis of the effectiveness of mitigation measures proposed for sage-grouse within the planning area.

R-64: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-65: BLM has repeatedly failed to provide any analysis, whether field experiments or literature reviews, that examines the effectiveness of the proposed 0.25-mile buffers where disturbance would be prevented. Roads and wells would still be built within 2 miles of sage-grouse leks and within 1 mile of sharp-tailed grouse leks as long as construction occurred outside the breeding/nesting season. This is the very area for which experts have recommended that no oil and gas facilities or infrastructure be built (Connelly et al. 2000).

R-65: See the Monitoring Appendix for management options BLM could take if a threshold is reached. The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-66: Mitigation measures have to allow pronghorns, elk, and mule deer to migrate and use their winter

ranges optimally. Such a mitigation measure would be allowing no surface disturbance on big game crucial winter range and migration corridors. BLM should also analyze an alternative that at least requires all roads within big game crucial winter range and migration corridors to be gated and places a moratorium on all human presence and vehicle traffic within crucial winter range and migration corridors between November 15 and April 30.

R-66: The FSEIS is not a leasing document where stipulations are developed. See Chapter 2, Alternatives Considered but not Analyzed, Leasing. Current stipulations to minimize the potential for impacts to big game species from project-related CBNG activities require no surface use of big game winter range areas from December 1 through March 31 for development related activities. While not eliminating all adverse impacts, this seasonal restriction does reduce the level of potential impacts during the most crucial time. Additional data could indicate the timing of this stipulation should be adjusted, BLM could adjust the stipulation accordingly. There appears to be little to no seasonal migration for mule and white-tailed deer within the Planning Area. Should additional data be developed indicating migration corridors for other big game animals would have to be protected to avoid unacceptable impacts, then BLM could adjust the stipulation accordingly. Chapter 2 states BLM could require actions such as restricting use in crucial habitats to protect wildlife or their habitats.

C-67: BLM has provided no evidence that a road density of 3 miles per square mile will support big game (or other wildlife). The best available science indicates that densities must be held below 1 mile per square mile to maintain habitat function.

R-67: The wildlife screen for the management of wildlife habitat under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-68: We are concerned that "active" raptor nest sites are defined as only those that have been occupied during the past 2 years. Most raptors have multiple alternate nest sites that are used repeatedly within a nesting territory, yet it is common for a nest site to go unused for two or more years, only to have nesting use return again. BLM should analyze and present the monitoring data it has in its own files, compare presence and nest success data to proximity to wells and roads (which data the BLM also possesses), and present some conclusions on the effectiveness of seasonal mitigation measures by species.

R-68: The revised WMPP includes seasonal restrictions that were developed through consultation with MFWP and FWS. The criteria to determine nest activity was modified to seven years. The WMPP will monitor effectiveness of the seasonal restrictions around raptor nests.

C-69: BLM should establish adequate nest buffers (a minimum of 1 mile in diameter for all species, with larger buffers for ferruginous hawks) around nest sites, preventing all construction of developments (such as wells and roads) that would lead to future disturbance of nesting raptors through focusing human activities in these areas. Seasonal restrictions are insufficient.

R-69: BLM has implemented a ½ mile No Surface Occupancy stipulation around Ferruginous Hawk nests and timing restriction of ½ mile around all raptor nests. The WMPP includes buffers around raptor nests, based on consultation with MFWP and FWS. Adaptive management will provide an opportunity to evaluate the need to modify buffers. POD approval will include site-specific assessment of well and road placement relative to raptor nests to avoid continued disturbance.

C-70: The DSEIS presents no population estimates for sage-grouse. How many of the leks are currently active, how many inactive, and how many historic? What are the lek count data at each lek (lek count data should be readily available for many leks)? What proportion of the nationwide populations of these species are represented by the populations in the planning area? What are the lek attendance trends for each lek, and what current human activities are affecting these trends?

R-70: Data on the number of active leks surveyed and average male attendance at those leks is included within the Wildlife section of Chapter 3. In addition, an annual report summarizing monitoring information, as outlined in the WMPP will track the status of leks in and adjacent to development. A discussion of sage-grouse population relevant to the Planning Area is also included within the Wildlife section of Chapter 3 under the heading of Sage-grouse Distribution, Habitat Needs, and Population Dynamics.

C-71: BLM has made no attempt to gather comprehensive baseline information on nesting raptors throughout the planning area.

R-71: Available data on raptors is included within the Wildlife section of Chapter 3 and within the Wildlife Appendix, Wildlife Monitoring and Protection Plan, and the Biological Assessment. In

addition, inventory/monitoring for raptors has been conducted and will continue.

C-72: It is certain that elk and pronghorn populations are migrating freely across the state line and the cumulative effects analysis is equally lacking. Numerous species of migratory birds (passerines and raptors, including BLM sensitive and threatened species under the Endangered Species Act [ESA]) are listed in the DSEIS, yet BLM makes no attempt to look cumulatively at the factors affecting their population dynamics range-wide. Both prairie dogs and sage-grouse found within the planning area are parts of a larger common population shared between Montana and Wyoming, yet the agency makes no effort to examine the impacts of development in Wyoming in the context of making an overall assessment of population viability for these species.

R-72: Potential impacts resulting from project-related CBNG activities, including potential cumulative impacts, are discussed within the Wildlife section of Chapter 4. Additional analyses would be conducted at the site-specific POD level.

C-73: The DSEIS inappropriately abandoned a flexible adaptive management strategy designed to provide protection for wildlife without needlessly creating uncertainty and impeding development. Instead, preferred Alternative H mandates, in advance, blanket imposition of a set of undefined mitigation measures, an approach that unnecessarily restricts BLM's flexibility.

R-73: The wildlife screen for the management of wildlife habitat under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-74: Please define/explain the proposed factors that are included in the definition or identification of a crucial habitat area. Furthermore, please define/explain any crucial habitat areas within the Powder River Basin and cross-reference them with the oil and gas leases they affect.

R-74: Crucial habitats are defined using BLM/MFWP data, research findings, etc. Crucial habitats for sage-grouse, big game, and migratory songbirds include areas necessary for maintaining viable populations. The specific requirements encompass habitats for breeding, raising young, foraging, and wintering. Sage-grouse crucial habitat consists of large intact patches of sagebrush. Big game crucial habitat includes winter range and elk calving areas. Migratory bird crucial habitat includes sagebrush, native grassland, riparian, and wetland communities. CBNG development potentially affecting any particular crucial habitat would be assessed at the individual POD level. Maps showing crucial habitat within the planning area are contained within the Wildlife section of Chapter 3.

C-75: Please include detailed documentation on how four crucial sage-grouse habitat (page 3-124) areas were delineated.

R-75: Information on how crucial sage-grouse habitat was determined is presented within the Wildlife section of Chapter 3 under the heading of Ongoing Sage-grouse Habitat and Oil and Gas Research.

C-76: Please clarify/explain how BLM proposes to manage the sage-grouse population within the crucial habitat areas given the hunting of this species, especially in light of the recent public identification of these areas as crucial sage-grouse habitat.

R-76: MFWP is responsible for setting hunting harvests and managing the sage-grouse population. BLM will manage the habitat in the area in a manner consistent with maintaining a viable population.

C-77: Please define/explain the process an operator can take (i.e., wildlife surveys, monitoring, mitigation measures, etc.) if an operator chooses to develop within a crucial sage-grouse habitat area.

R-77: The wildlife screen for the management of wildlife habitat under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2. In general, an operator will need to demonstrate how the development/ production of the CBNG wells could occur while still protecting wildlife species that rely seasonally or year-long on crucial habitats.

C-78: There is a concern that BLM could use the lack of information to prevent operators from exercising their lease rights until they have had time to collect relevant sage-grouse data before submitting a POD. This requirement is unwarranted because preliminary research, which is the foundation of this requirement, has not been finalized and peer-reviewed. Therefore, we recommend this screen be eliminated or revised to accommodate the concept of adaptive management, whereby monitoring could be used to establish whether there are significant negative impacts during operations, as well as appropriate mitigation measures.

R-78: Since the publication of the DSEIS, the referenced research has been peer reviewed. The wildlife screen for the management of sage-grouse habitat under the Preferred Alternative, Alternative

H, has been modified. See Alternative H within Chapter 2.

C-79: Conservation actions have to consider the relationship between CBNG and West Nile Virus and attempt to mitigate those conditions conducive to its spread. The commenter supports reducing the potential of CBNG impoundments to produce late summer mosquito populations that vector West Nile Virus. The DSEIS fails to consider groundwater reinjection as an alternative, which could limit some sources of West Nile Virus infestation.

R-79: The potential for CBNG-produced water managed in surface impoundments to increase the availability of surface water bodies, which in turn may increase mosquito populations within a given POD area, is discussed within the Wildlife section of Chapter 4. Mitigation measures that would be implemented to minimize the potential for CBNG surface water impoundments to serve as breeding grounds for mosquitoes are contained within the Wildlife Monitoring and Protection Plan included in the Wildlife Appendix. One alternative to the surface management of produced water is subsurface injection. Subsurface injection or reinjection of produced water would make it unavailable for mosquito breeding. Subsurface injection or re-injection as a method of produced water management is discussed under the Hydrological Resources section of Chapter 4.

C-80: The DSEIS fails to address how a CBNG operator will prove that operation will maintain the connectivity of sage-grouse habitat within the PRB and adjacent regions.

R-80: The wildlife screen for the management of sage-grouse habitat under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-81: MFWP is concerned about the 20 percent disturbance threshold defined in the SEIS and considers it inadequate to protect fish and wildlife populations in the project area. Research in Wyoming shows that impacts to wildlife from disturbed habitat is cumulative, and wildlife populations can be severely impacted at disturbance levels much less than 20 percent. There is no scientific justification for using this 20 percent threshold for limiting development, and more conservative thresholds are required (Connelly, I.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000). Considering sage grouse alone and their observed level of sensitivity to various disturbance factors, the 20 percent threshold is inappropriate.

R-81: The wildlife screen for sage-grouse and mule-deer habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-82: MFWP believes that a combination of Alternatives F, G, and H would provide the best opportunity to conserve fish and wildlife resources.

R-82: BLM is tasked with developing the best opportunity to conserve fish and wildlife, while also providing an opportunity for industry to develop oil and gas resources. BLM has developed an alternative, Preferred Alternative H, which it believes achieves a balance between the development of CBNG, while providing for protection of the environment that supports wildlife and fish populations. The wildlife screen under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-83: Under the development of roads, pipelines and other infrastructure (p. 2-24), it is stated that the authorized officer could approve high-voltage aerial power lines by application. BLM should provide estimates based on cost or evidence from Wyoming on what proportion of PODs and applications will request aerial powerlines. There are plans to reduce impacts of aerial power lines where feasible, but if the majority of lines constructed are aerial, negative impacts will be unavoidable (only in crucial sage-grouse habitat are distribution lines required to be buried; p. WMPP-10).

R-83: Although the authorizing office can approve above-ground, high-voltage, aerial power lines by application, the preference is for buried lines. Therefore, it is not implied or suggested the majority of lines will be aerial, resulting in negative impacts. The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2.

C-84: A slower pace of development in crucial habitat areas may be a result of insufficient long-term data to identify population trends. The time that constitutes long-term data is not defined.

R-84: The timeframe for developing a sufficient set of data will vary by species and area, as well as variations in monitoring data collected. At this time, BLM does not have a set timeframe to determine what would be sufficient or insufficient in the long term.

C-85: "Raptor inventories would be conducted over the entire Coal Bed Natural Gas project area every 5 years by the BLM and MFWP." This document

cannot commit and does not have authority to commit MFWP to this. Resources within MFWP have not been identified at this time, and making the assumption that MFWP will be able to, or will agree to, do so is premature. In addition, no indication is provided for how funding or resources will be made available for MFWP to accomplish this.

R-85: BLM is committed to keeping MFWP informed about wildlife surveys and recognizes BLM does not have the authority to commit resources from MFWP to participate in conducting wildlife surveys. Language in the FSEIS has been modified to show that participation by MFWP in conducting wildlife surveys would be as its resources allow.

C-86: "As development schemes are identified and approved ongoing monitoring would be conducted to ensure development is not displacing sage grouse to the point that a sustainable population is not maintained." What if monitoring indicates development is displacing sage-grouse?

R-86: The wildlife screen for sage-grouse habitat management under the Preferred Alternative, Alternative H, has been modified. See Alternative H within Chapter 2. BLM recognizes some displacement of sage-grouse will occur as a result of project-related CBNG development. The goal of implementing the wildlife screen is not to avoid all displacement of sage-grouse, but to maintain sustainable populations. BLM will work with state and federal agencies and operators to determine if the guidelines developed to achieve this goal are effective, or if additional measures are required. The additional measures that could be used would likely be site-specific and could include curtailing or restricting development within impacted areas.

Alternatives

Comment 1 (C-1): Phased development should consist of developing CBNG watershed-by-watershed to minimize utility corridors, roads, and the disruption they cause to agriculture and wildlife. Phased development watershed by watershed would avoid unnecessary cost and provide for more effective monitoring.

Response 1 (R-1): For a discussion on various "Phased Development" alternatives considered but not analyzed, see Chapter 2, "Alternatives Considered but not Analyzed in Detail" under "Phased Development (other than Alternatives F, G and H)".

C-2: The proposed alternatives do not take into account the cumulative impacts of methane development on private as well as public lands. Significant habitat degradation could occur in watersheds where a large proportion of the land is in private ownership. The screens should involve landscape-level planning that includes cumulative effects analysis.

R-2: The SEIS includes a landscape level analysis that provides detailed information on cumulative impacts resulting from CBNG project activities regardless of ownership. Information on cumulative impacts is in Chapter 4 and the Minerals Appendix of the SEIS. The resource screens do not differentiate between impacts resulting from private, state, or federal development, but rather consider potential impacts from all development. As an example, under the water screen, should surface water quality standards be exceeded, BLM would implement mitigation measures on federal development to bring water quality back into compliance. BLM would also work with MDEQ to mitigate the impact from private or state development. As such, while BLM's actions are directed to federal development, the resource screens consider cumulative impacts from all development.

C-3: Weed mapping should be conducted to provide a baseline and help guide the screening process.

R-3: Vegetation surveys, including for noxious weeds, will be conducted at the POD level on federal lease areas to develop baseline information before beginning operations.

C-4: What authority does BLM or anyone else have to stop CBNG development if it begins to damage the wildlife, water, air, noise, or any other of the environmental aspects that should be protected?

R-4: The Preferred Alternative, Alternative H, allows for CBNG development with monitoring conducted to evaluate if resource values are being protected. BLM would compare the monitoring data against the four resource value screens contained in Alternative H. BLM has the authority to implement mitigation measures and/or decline applications if unacceptable impacts to resource values are occurring.

C-5: The DSEIS does not address whether the pace and geographic distribution of CBNG development to date in Montana, or in the northern portion of the Powder River Basin in Wyoming, effectively constitutes phased development under the term's potential definitions. Thus, the fundamental distinction between the new alternatives and the

CBNG development status quo has not been established.

R-5: Phased development has more than one definition (see R-1). The distinction between the alternatives is apparent when reviewing the effects of one alternative vs. another (for example, current management (Alternative A) versus the preferred alternative (H). The pace of CBNG development has been adequately addressed for each alternative; see the "Comparison Summary of Impacts" table at the end of Chapter 4 for comparisons.

C-6: The problem with phased-in development, based on a numeric criteria, is the sustained impact this will exert on the landowner/surface user, split-estate. It would be more prudent to develop each area as a whole. This will prevent continued disruption of the landowner's surface and operations that may drag into decades if numeric limitations are adopted.

R-6: The Preferred Alternative, Alternative H, supports a phased development approach based on the protection of resource values using four resource screens. A numeric limit on development, as included in Alternatives F and G, is not an element of BLM's Preferred Alternative.

C-7: The SEIS fails to look at phasing development by aquifer. This would allow one seam to be developed, while another is used for water disposal.

R-7: See R-1

C-8: During the alternative development phase of this DSEIS we asked that BLM analyze a geographically phased alternative in which designated areas of land would be developed for CBNG extraction through their production phase, then reclaimed before moving on to extract CBNG in another area.

R-8: See R-1.

C-9: If BLM desires a phased development approach, it could occur through future lease sales. This would allow BLM to restrict or consider establishing development plans confined to certain areas, within specific seams, at pre-determined APD approval rates, or with baseline monitoring in place and adequately evaluated based on actual results from preceding development.

R-9: BLM oil and gas leasing decisions and lease stipulations, including those applicable to CBNG, were previously analyzed in the BLM 1992 Final Oil and Gas RMP/EIS Amendment. Those decisions were approved in the project's February 1994 ROD. Analyzing new federal lease decisions, such as closing federal areas of oil and gas estate in the Powder River and Billings RMP areas, are therefore, beyond the scope of this SEIS. Also see response to R-1 and Chapter 2 under the Alternatives Considered but Not Analyzed in Detail section.

C-10: The cumulative impact analysis is not supported by the necessary data for BLM to select any of the alternatives in the SEIS.

R-10: For data used in preparation of the SEIS see the Bibliography. Cumulative impacts resulting from the implementation of the proposed action are included throughout Chapter 4 of the SEIS. Additional information on cumulative impacts is contained in the Minerals and the Air appendices. The data supplied adequately describe cumulative impacts and allow selection of a preferred alternative, while recognizing that additional site-specific analyses will be required within a plan of development before project-level CBNG development begins.

C-11: The DSEIS does not indicate when BLM would apply modifications to a POD on the basis of using the four filters or screens proposed in Alternative H. Is BLM going to apply modifications to a POD during permitting and construction, or after development has commenced?

R-11: A decision flow chart outlining how and when the four screens would be used under the Preferred Alternative, Alternative H, is presented on Figure 2-1 within Chapter 2.

C-12: One of the requirements of a POD is that digital project maps depicting all infrastructure installations necessary for the project, etc., be included. BLM should clarify that digital includes PDF files of the proposed infrastructure.

R-12: Digital refers to GIS maps or AutoCAD files.

C-13: Mandated use of transportation corridors could easily infringe on operator/surface owner agreements.

R-13: BLM will take into account any difficulties encountered by an operator when consulting with adjoining operators, as well as the wishes of the landowner(s) and existing operator/surface owner agreements. The intent of this provision is, to minimize to the extent achievable, the overall area of surface disturbance and the number of roads and utility corridors.

C-14: The SEIS states the following: "Prior to approving a road, the operator, landowner, the BLM, adjacent landowners, and adjacent gas leaseholders would coordinate long-term planning for roads in the area." What type of road is being referred to here?

R-14: BLM is referring to all roads constructed for the purposes of developing CBNG.

C-15: The SEIS states the following: "Low voltage (440-v) distribution powerlines would be buried. The authorized officer (AO) could approve proposed high voltage, aerial power lines by application. The AO could approve above-ground, low-voltage distribution power lines only if the operator could demonstrate that it would not be feasible or it would be impracticable to bury them (economic issues, technically impossible, etc)." The DSEIS is mandating the use of buried powerlines with no consideration of surface owner desires.

R-15: BLM recognizes that power lines cannot always be buried. The intent of this requirement is to remove power lines and poles as potential raptor perches and to prevent the impact that multiple power lines would have on the visual landscape.

C-16: Developing leases in stages could help reduce impacts on surface resources such as air, water, and wildlife. In phased development of leases, it would be imperative that, before moving on to the next phase, the prior phase of the lease that is developed not only be reclaimed, but actually restored to its fully functioning capacity to support the economic and ecosystem values it supported before development. Phased development of leases would also provide BLM and other agencies with an opportunity to gather information to use in adaptive management to assess the impacts of the earlier phase, and if advisable, change the way the next phase occurs to address those impacts.

R-16: See R-1 and R-9.

C-17: It must be emphasized that there is likely no one-size-fits-all phased development alternative that would best protect the important resources of a given area within Montana's portion of the Powder River Basin. For example, important wildlife populations such as sage-grouse may be concentrated in certain regions, just as the availability of receiving formations for the reinjection of CBNG wastewater will vary by location. Therefore, BLM should create specific management areas and implement different concepts of phased development to protect the resources as they vary from one area to another.

R-17: The Preferred Alternative provides management actions to address the differences between areas and the resource issues found within each area. See also R-1.

C-18: The new Preferred Alternative (Alternative H) must be "environmentally preferable." BLM has not established that Alternative H is environmentally preferable to Alternative E.

R-18: In accordance with 40 CFR 1505.2(b) "Record of decision in cases requiring environmental impact statements "BLM must: "(i)dentify all alternatives considered by the agency in reaching its decision, specifying the alternative or alternatives which were considered to be environmentally preferable."

A record of decision (ROD) has not yet been made. After the Governor's consistency review ends, a ROD will be issued. When the ROD for the SEIS is issued, it will include a section discussing the "environmentally preferred alternative".

C-19: Judge Anderson rejected almost all other challenges to the FEIS and ruled that "as a whole, the FEIS adequately considered the impacts of CBM development in the Powder River Basin," Order, CV 03-69-BLG-RWA (February 25, 2005). Therefore, the SEIS should be restricted to the judge's stated areas of concern. However, the preferred alternative involves a new system of mitigation measures above and beyond the judge's requirement to consider a phased development approach. Judge Anderson characterized phased development as involving numeric limits on wells or geographic limits on areas developed. The SEIS, in contrast, employs a radically different approach in Alternatives F, G, and H, which does not control development by a specified number of wells or defined geographical area. On the contrary, these alternatives would impose a discretionary system of mitigation measures and enable BLM to arbitrarily limit APD and POD approvals without objective standards.

R-19: Judge Anderson's order did not restrict the scope of BLM's analysis. Alternatives F and G analyzed phased development based on a two-tier system of numerical controls, involving numeric limits on wells annually and by watershed area. The watershed area numeric limits would place geographic limits on areas developed. The preferred alternative (H) supports a phased development approach by using adaptive management based on the protection of resource values using four resource screens. These resource screens control and provide for monitoring development to mitigate or reduce potential effects.

C-20: From a fish and wildlife habitat perspective, restoration is equally as important as attempting to mitigate during development. To this end, there have to be further discussions in the SEIS defining the specific commitments that BLM will make to ensure that public lands are restored to an acceptable functioning condition. The SEIS should outline the

restoration process and BLM's commitments to restoration to ensure that Montana's public lands are not only protected during development, but also restored upon termination of CBNG energy development activities.

R-20: Reclamation plans are required elements of plans of development that each operator must submit for each CBNG development under the Preferred Alternative, Alternative H. Reclamation plans include measures for interim reclamation of such things as well pads, as well as long-term reclamation of wells and roads and other associated facilities.

C-21: Under Preferred Alternative H, the CBNG APD and project POD guidance manual says the following: "BMPs are voluntary yet the SEIS suggests they are mandatory." BLM needs to clarify whether BMPs are mandatory.

R-21: The term BMP is a conceptual term representing the idea that BLM will be requiring better practices. The actual practices themselves will be either operator committed measures or BLM conditions of approval (referred to as stipulations if required as part of a BLM right-of-way grant). Practices that will be included as conditions of approval if they are not part of a proposed plan of development are specified in the description of the preferred alternative and in Table 2-1. In addition, other practices that BLM is encouraging the use of are included in the Wildlife Monitoring and Protection Plan (see Wildlife Appendix). These measures are identified as Programmatic Guidance for the Development of Project Plans in the Wildlife Monitoring and Protection Plan. These measures may also be required conditions of approval if they are not included in a plan of development, based on the review of each proposal and site specific resource conditions.

C-22: The decision flow chart for the preferred alternative does not include a path from BLM to MDEQ or vice versa. Yet the water screen requires cooperation and communication with MDEQ. BLM should define how this will this occur.

R-22: MDEQ is not directly involved in the decision process, however BLM would coordinate the agency on implementing mitigation or protective measures relating to the four resource screens under the Preferred Alternative, Alternative H.

C-23: "Full scale development would be allowed if each POD passed the four screens." These screens are not quantified.

R-23: BLM will use an adaptive management approach to implement the four resource screens. Under adaptive management, monitoring would be conducted to determine if the potential for impacts to resources would occur from the ongoing development. If there is potential for impacts to occur, BLM would work with the operators and state agencies to implement site-specific mitigation measures.

C-24: With respect to evaluating monitoring data; who will be responsible for this effort, and whose interpretation will prevail? Differences of opinion are inevitable. How will they be resolved in a timely enough manner to reduce impacts to wildlife species?

R-24: BLM will be responsible for evaluation and interpretation of the monitoring data via coordination with MFWP and FWS.

C-25: It is interesting to note that many of the BMPs specifically requested by the conservation community and the public (such as directional drilling, drilling multiple wells from a single pad, etc.) will specifically not be implemented under any action alternative.

R-25: BLM does consider requiring directional drilling in several of the alternatives (see Chapter 2, alternatives B, D, and (unless exempted) alternatives E, F and G.) Multiple coal seams developed per well bore are considered in Alternatives B and D and simultaneous coal seam development is considered under alternatives B and D. See R-22 for BMP implementation.

C-26: Phased development will mean that, in the Powder River Basin, development may not proceed in contiguous geographic areas, but, instead, state and private leases will be developed before federal leases. Thus, multiple mobilizations of workers and equipment will be necessary. First, a right-of-way corridor will be established to service the state and private wells, and later these rights-of-way will be expanded and augmented to service the federal wells. Multiple mobilizations will result in additional risks to wildlife and additional air quality impacts. They are particularly disruptive to surface owners because they create more environmental and aesthetic harms.

R-26: The comment points out reasons why some phased development alternatives were not considered in detail. See R-1. Phased development, as described within Preferred Alternative H, does not mean that state and private leases would be developed first, followed by development of federal leases. BLM anticipates the development to be concurrent with private and state due to the (mostly) checkerboard landownership pattern.

C-27: The necessary adoption of 80-acre spacing instead of 160-acre spacing to accommodate phased development translates into nearly twice the number of wells, roads, infrastructure, surface disruption, and produced water. It will also result in nearly twice the construction-related disturbances. For these reasons, BLM should reject all alternatives based on formal phased development, including Preferred Alternative H.

R-27: The plan the SEIS is supplementing (BLM 2003) assumed 80-acre spacing for producing wells in Alternatives B through E. This assumption is carried forward in the SEIS for alternatives F through H. Note, the plan also assumes 160-acre spacing for exploration wells. Also, spacing is per coal seam, so in areas with three coal seams where wells are co-located on the surface, the construction-related disturbances are reduced by approximately two-thirds.

C-28: The threshold/trigger numbers contained in the SEIS only require BLM to evaluate the situation to determine if additional APDs could or should be approved. The SEIS does not detail what form this evaluation would take or what the basis would be for allowing or denying additional APDs. Please provide an explanation/clarification of how BLM justifies the use of these threshold values when no significant difference in impact can be derived between Alternatives E and H.

R-28: The threshold values or triggers are identified in the description of Alternative H and the Monitoring Appendix. See the Monitoring Appendix under "Remedial Action Trigger" and "Management Options".

C-29: The SEIS does not discuss when the four resource screens contained within the Preferred Alternative will go into effect.

R-29: Alternative H will go into effect when the Record of Decision (ROD) is signed. BLM will then implement the plan. The ROD is anticipated to be signed this winter.

C-30: Alternative H may still allow for full-field development, which runs contrary to the purpose of analyzing a phased development alternative.

R-30: There are several interpretations regarding what constitutes "phased" development (see Chapter 2, "Alternatives Considered but not Analyzed in Detail", under "Phased Development (other than Alternatives F, G and H)". Less than full-field development was analyzed in alternatives F and G. While required to analyze phased development, BLM is not required to select phased development as the preferred alternative.

C-31: Numerous documents, reports, and scientific studies on a wide variety of resource subjects were available to BLM before and during preparation of this DSEIS; however, it appears that these data, updated data, and new data were not analyzed fully for many issues in the DSEIS.

R-31: All applicable reports were reviewed and information analyzed as appropriate. The documents are incorporated into the SEIS (see Bibliography)

C-32: The Montana and Wyoming EISs must be combined to assess cumulative effects.

R-32: Cumulative impacts are disclosed in resource sections of Chapter 4. The analysis was based on the combined impact of similar actions. On February 25, 2005, the U.S. District Court for the District of Montana issued an order in the *Northern Plains Resource Council (NPRC) v. BLM*, Cause No. CV 03-69-BLG-RWA and *Northern Cheyenne Tribe v. Norton*, Cause No. CV 03-78-BLG-RWA cases which previously had been consolidated. In its order, the Court found that BLM's decision to use two documents to assess cumulative impacts and similar actions was properly within its discretion. The Court's reasons for this finding are found on pages 21 through 27 of the February 25, 2005 Order.

C-33: Alternatives F, G, and H are deficient because the limits on the number of APDs approved each year and the percentage of disturbance on BLM-administered lands are not arbitrary and not substantiated by science-based analysis or evaluation.

R-33: The cumulative limit placed on federal APDs would be based on 5 percent of the total number of state, private, and federal wells (18,225 wells) predicted to be drilled over 20 years (see Chapter 2 under Alternatives F and G). The 5 percent takes the total number of wells (18,225) divided by 20 years, resulting in 5 percent per year. The 5 percent limit was chosen to level the pace of development over a 20-year period and to apply a numerical limit to federal APD approvals.

The FSEIS modified Alternative H, does not contain numeric limits, but it phases development through implementation of four resource screens and POD requirements, as well as use of adaptive management to define modifications or mitigation measures to existing operations necessary to provide for the protection of resources.

Monitoring

Comment 1 (C-1): Monitoring as included in the SEIS is unfunded at both the state and federal level.

Response 1 (R-1): Monitoring of surface water, groundwater, and wildlife is funded annually, has been ongoing for a number of years, and is conducted by a variety of agencies including BLM, MDEQ, MFWP, FWS, and USGS. CBNG operators are also required to conduct monitoring as part of their water management plans and wildlife monitoring and protection plans submitted with their plans of development. BLM recognizes that it does not have the authority to commit other agency resources to conduct monitoring.

C-2: The procedure and schedule for monitoring needs to be developed. BLM needs to ensure BMPs are being implemented by companies.

R-2: The procedure and schedule for monitoring is located within the Monitoring Appendix, Table MON-1. Also, BLM has a POD Manual that provides guidance to operators. (The Manual will be updated upon conclusion of the SEIS.)

C-3: Most of the alternatives listed in the SEIS refer to industry creating a wildlife monitoring plan for each POD. This plan has to be in compliance with BLM's wildlife monitoring protection plan. This plan includes Montana as a primary source of labor and information. These additional monitoring tasks and informational needs have not been approved within MFWP.

R-3: BLM is committed to keeping MFWP informed about wildlife surveys and recognizes that BLM does not have the authority to commit unfunded resources from MFWP to participate in conducting wildlife surveys.

C-4: Using the fourth order watershed unit as the basic monitoring unit is too broad. The ability to monitor direct impacts to fish, wildlife, and water resources at this large a scale is unlikely. Localized impacts can be identified to resources if requirements allow for such monitoring, but monitoring of the entire upper Tongue River Basin to determine changes in fisheries or terrestrial animals can only be generic at best. This type of information does not allow for required changes to be implemented by local operations. The area in question for phased development has to be reduced if monitoring is to be pertinent.

R-4: Monitoring at the fourth order watershed level is appropriate and would supply effective information in establishing trends. Monitoring on a smaller scale would be implemented should data collected indicate a need for more detailed information.

C-5: Well-defined thresholds and decision points for identifying when adaptive management actions would be implemented have not been described.

R-5: Threshold values or triggers for the air impact, water, and wildlife resource screens are described in the description of Alternative H in Chapter 2 and the Monitoring Appendix. Please refer to the decision flow chart included as Figure 2-1 in Chapter 2 defining how these threshold values would be used and implemented. Also, see the Monitoring Appendix under "Remedial Action Trigger" and "Management Options".

Other Comments

Comment 1 (C-1): At several points in the SEIS, it is mentioned that MDEQ will monitor water and air quality. Does the SEIS address impacts to the state resources?

Response 1 (R-1): The SEIS addresses impacts that could occur for state, federal, and private resources from project-related CBNG activities for each alternative in Chapter 4.

C-2: Did BLM account for cumulative impacts resulting from the TRR? There's only one paragraph in this document that deals with the TRR. There are many resource impacts from that development, and I think we need BLM, for CBNG development, to deal with the reasonable foreseeable development of the TRR.

R-2: Cumulative impacts resulting from the construction of the TRR are included throughout Chapter 4 of the SEIS. For example, the effects to vegetation from the TRR are addressed within the Vegetation section of Chapter 4 under the heading of Cumulative Impacts. Additional information on the cumulative impacts resulting from the TRR are contained in the Minerals Appendix and the Air Quality Appendix.

C-3: Noise would be a major CBM impact on the ambient quiet of the region due to (but not limited to) increased road traffic, drilling operations, and compressor stations. No analysis is presented of the combined and cumulative increase in noise, not only from the construction, but also the operation, of the TRR should it be approved.

R-3: Potential impacts from project-related noise are contained within the Cultural, Lands and Realty,

Social and Economic Values, and Wildlife sections of Chapter 4 under the heading of Impacts from Management Common to All Alternatives.

C-4: Land Use. For specific properties, agricultural operations would be affected by CBM development, including, but not limited to, soil and vegetation disturbance, disruption of pasture or field use, disruption of cattle movement and location, increased problems from fence breech or gate mismanagement, and potential cattle illness or death from hazardous materials or conditions. If these same agricultural operations will also be crossed by the TRR, the negative impacts would be compounded for the land owner. Additionally, any and all of the industrial development could and would impact recreational users of the area, both directly and indirectly (particularly cumulative impacts to wildlife populations). The cumulative impacts of these problems were not analyzed.

R-4: Potential impacts to agricultural operations from proposed project activities are contained in the Livestock and Grazing section and the Soils section of Chapter 4. Cumulative impacts, including impacts from the TRR, are also contained in the Livestock and Grazing section of Chapter 4. Potential impacts to recreational and wildlife resources are discussed within the Recreation and Wildlife sections of Chapter 4. Additional information on cumulative impacts is contained within the Mineral Appendix.

C-5: The planning area described in the DSEIS has omitted areas of Custer and Dawson counties that might be affected from the development of CBNG. The CEQ regulations state that "...the environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration" (40 CFR §1502.15). Further, the regulations state that if an area that may be affected by the project extends beyond the project area, the entire area of potential effect should be included in the affected environment.

R-5: CBNG development activities are not expected in the areas of northern Custer County or Dawson County for the foreseeable future. Air quality and water quality resources in these areas may be indirectly affected by CBNG development in the Powder River Basin.

Potential impacts to air quality throughout the Planning Area, the state of Montana, and portions of surrounding states were evaluated by conducting an air quality model. These results are contained within the Air Quality and Climate section of Chapter 4, the Air Quality Appendix, and the Air Quality Modeling Technical Support Document.

The analysis conducted for the Tongue River at Brandenburg Bridge (USGS Station 06307830) and for the Yellowstone River near Sidney (USGS Station 06329500) are believed to be representative of the water quality effects that will be experienced in these areas. These analyses are in the Hydrological Resources section of Chapter 4.

C-6: The mineral leases for CBM should be reconsidered because these leases were sold without the natural resources data necessary to evaluate whether the impacts from development would significantly negatively affect those other resources.

R-6: Analyzing decisions such as oil and gas estate is beyond the scope of this SEIS. See Chapter 2 of the SEIS, Alternatives Considered But Not Analyzed in Detail, Leasing.

C-7: One of the rationales for the SEIS was a need to further expand on the cumulative impacts of development in the planning area and, more specifically, in the Powder River Basin. Although some consideration was given for the additional impacts of the TRR on wildlife (page 4-254), the overall cumulative impacts analysis was not conducted. For example, the removal of the intake dam by the Bureau of Reclamation is as reasonable and foreseeable as the TRR.

R-7: The Intake Dam is outside the Powder River Basin. The cumulative impacts for wildlife are addressed in the Wildlife section of Chapter 4.

C-8: On page 6 of the Monitoring Appendix, correct the acronym FLMPA to FLPMA in the frequency and duration column for Lands and Realty.

R-8: The correction was made in the FSEIS.

C-9: BLM did not fully study the combined effects of coal bed methane extraction and the TRR.

R-9: Cumulative impacts resulting from the construction of the TRR are included throughout Chapter 4 of the SEIS. Additional information on the cumulative impacts resulting from the TRR is contained in the Minerals Appendix, the Air Quality Appendix, and the Air Quality Technical Support Document.

C-10: Throughout the document there is a general lack of literature citations to support the rationale for the stringent and somewhat unique restrictions being imposed on oil and gas operators.

R-10: Literature citations have been added to the FSEIS as appropriate.

C-11: The SEIS should look at using solar power for compressors in the lines.

R-11: The purpose and need for the document is to analyze the effects from CBNG development (See Chapter 1 under Purpose and Need). Alternative management, such as the use of alternative energy sources, to existing management must meet the purpose and need for completing the plan. See Chapter 2 in the section Alternatives not Analyzed in Detail – Alternative Sources of Energy for a full explanation.

C-12: The SEIS has to define the following terms and phrases:

- Screening process
- Water screen
- Threshold values relative to the water quality standards
- Regional scale monitoring
- Unacceptable impacts
- Excessive erosion
- Develop appropriate measure
- Appropriate mitigation measure
- No additional CBNG discharges [is that in terms of numbers of sites, or volume of discharge?]

R-12: The screening process, as used within the Preferred Alternative, Alternative H, is outlined within Figure 2-1 in Chapter 2.

The water screen and threshold values relative to water quality standards are defined under the heading of Alternative H – Preferred Alternative – Multiple Screens within Chapter 2.

With respect to monitoring, Table MON -1 within the Monitoring Appendix outlines the types of monitoring to be conducted and details whether the monitoring is area-specific or required throughout the entire CBNG development area.

The definition of "unacceptable" would be developed on the basis of site-specific conditions and water management provisions contained in the water management plans.

Excessive erosion would be any erosion that would have the potential to reach and affect the water quality of a stream or water body.

Appropriate measures or appropriate mitigation measures will be selected on a site-specific basis that will consider seasonal variations and current cumulative impacts in the area.

"No additional CBNG discharges" means "no additional untreated CBNG discharges." Recent changes in MDEQ water quality standards under which EC and SAR have been designated as harmful parameters may result in MDEQ not allowing the untreated discharge of CBNG produced water. If future changes in water regulations would allow for the discharge of untreated CBNG produced water, BLM's water screen would still be applied.

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Biodiversity Conservation Alliance
Boone and Crockett Club of America
Bridger Canyon Property Association

Campfire Club of America
Citizens for Resource Development
Coalition for Peace and Justice
Colstrip Area Association of Business
Congressional Sportmen's Foundation
Conservation Force
Cottonwood Resource Council
Custer Resource Alliance
Custer Rod and Gun Club

Dallas Safari Club
Defenders of Wildlife
Delta Waterfowl Foundation
Ducks Unlimited

Earth Justice
Environmental Defense

Flathead Audubon Society
Foundation for North American Wild Sheep
Frontier Heritage Alliance

Greater Yellowstone Coalition

High Country Citizen Alliance
Houston Safari Club

Institute for Wildlife Protection
Izaak Walton League of America

Martinsdale Colony
Medicine Wheel Coalition
Montana Association of Conservation Districts
Montana Association of Counties
Montana Association of Oil Gas & Coal Counties
Montana Association of Petroleum
Montana Audubon Council
Montana Bowhunters Association
Montana Coal Council
Montana Coalbed Natural Gas Alliance
Montana Council of Trout Unlimited
Montana Environmental Information Center
Montana Farm Bureau Federation
Montana Farmers Union
Montana Grain Growers Association
Montana Native Plant Society
Montana Natural Heritage Program
Montana Outfitters & Guides Association
Montana Parks Association
Montana Petroleum Association
Montana Public Lands Council
Montana River Association
Montana Wilderness Association Eastern Wildlands Chapter
Montana Wildlife Federation

National Assembly of Sportsmen's Caucuses
National Parks Conservation Association
National Rifle Association of America
National Shooting Sports Foundation
National Trappers Association
National Trust for Historic Preservation

Distribution List (continued)

National Wild Turkey Federation
National Wildlife Federation
National Wildlife Society
Native Action
Natural Resources Committee
New Jersey Chapter – Sierra Club
North American Bear Foundation
North American Grouse Partnership
Northern Plains Resource Council
Northwest Mining Association

Orion – The Hunters Institute

Petroleum Association of Wyoming
Pheasants Forever
Pope and Young Club
Powder River Basin Resource Council
Public at Large
Public Lands Access Association
Public Lands Advocacy
Public Lands Foundation

Quails Unlimited
Quality Deer Management Association

Recreational Boating and Fishing Foundation
Rocky Mountain Elk Foundation
Rocky Mountain Environmental Denfense
Rosebud Protective Association
Ruffed Grouse Society

San Juan Citizens Alliance
Sand County Foundation
Sierra Club Billings Office
Society for Species Management
Southeastern Montana Sportsmen Association
Sporting Arms and Ammunition Manufacturers' Institute
Stillwater Protective Association
Sustainable Obtainable SOL

Texas Wildlife Association
The Environmental Services Network
The Institute for Environmental and Natural Resources
Theodore Roosevelt Conservation Partnership
The Wildlife Society
Tongue River Water Users Association

US Sportsmen's Alliance

Water Watch
Western Governors Association
Western Land Exchange Project
Western Organization of Resource Council
Whitetail's Unlimited
Wildlife Forever
Wildlife Management Institute
Womens' Voices for the Earth
Wyoming Outdoor Council

Yellowstone County Green Party
Yellowstone Valley Audubon Society

Schools and Libraries

AG Research Center
Big Horn County Library
Colorado State University Library
CSU – Dept. of Fish Wildlife Biology
Columbus University – Dept. of Env. Science
Harvard School of Public Health
Henry Malley Memorial Library
Little Big Horn College
Montana Bureau of Mines Geology
Montana Power Law Library
Montana State University
Montana Tech Geophysics Department
Montana Tech Library
MSU Billings
MSU Billings Environmental Studies Program
MSU – Fisheries Laboratory
Nicholas School of Environmental Earth Science
Northwestern University – Env. Policy Program
Oberlin College, Dept. of Psychology
Peter Yegen Jr. Yellowstone Co. Museum
Rocky Mountain College
Saint Labre Mission
Montana State Library
University of Michigan, School of Natural Resources
University of Montana, Flathead Lake Bio. Station

Tribes

Arapaho Business Council
Crow Tribe
Crow Tribal Chairman
Crow Tribal Contracts Office
Crow Tribal Council
Crow Tribe Cultural Commission
Crow Tribe - Elk River Law Office
Crow Tribe Energy Commission
Crow Tribal EPA
Crow Tribe Legal Department
Crow Tribe Office of Natural Resources
Eastern Shoshone Business Council
Fort Peck Tribes

Distribution List (continued)

Fort Peck Tribal - Minerals
Lower Brule Sioux Tribe
Northern Arapaho Business Council
Northern Cheyenne Chamber of Cmmerce
Northern Cheyenne Crazy Dog Society
Northern Cheyenne Tribe - Chair
Northern Cheyenne Tribe- Health
Northern Cheyenne Tribe - President
Northern Cheyenne Tribe - TERO
Northern Cheyenne Tribe – Dept of Natural Resources
Northern Cheyenne Tribal Council

Federal Agencies

Bighorn Canyon National Recreation Area
Bureau of Indian Affairs (BIA)
BIA – Northern Cheyenne Agency
Bureau of Land Management
BLM Billings Field Office, Montana
BLM Buffalo Field Office, Wyoming
BLM Cody Field Office, Wyoming
BLM Eastern Montana Resource Advisory Council
BLM Great Falls Field Office, Montana
BLM Havre Field Office, Montana
BLM New Mexico State Office
BLM Montana State Office
BLM Oregon State Office
BLM Wyoming State Office
Bureau of Reclamation
Department of Agriculture
Department of Energy
DOE – National Energy Technology Laboratory
Department of the Interior
Department of the Interior – Protest Coordinator
Department of the Interior - Solicitors Office
Federal Energy Regulatory Commission
National Parks Service
U.S. Army Corp of Engineers
USDA Farm Service Agency
USDA Forest Service (USFS) Regional Office
USDA Fort Keogh Research Station
USDA Natural Resources Conservation Services
USEPA Region 8
USEPA Region 8 Library Serials
USEPA Region 8 Montana Office
US Fish and Wildlife Service
USFS Ashland Ranger District
USFS Custer National Forest
U.S. Geological Survey

State Agencies

Honorable Governor Brian Schweitzer
Montana Board of Oil & Gas Conservation
Montana Chamber of Commerce
Montana Department of Environmental Quality
Montana DEQ - Coal & Uranium Board
Montana Department of Natural Resources & Conservation
Montana DNRC Southeastern Land Office
Montana DNRC Water Resources Division
Montana Fish Wildlife and Parks
Montana Department of Transportation
Montana Environmental Quality Council
Montana Fish, Wildlife and Parks
Montana Secretary State
Montana State Historical Preservation Office
Oregon State Fisheries
State Auditor Office
Washington Department of Ecology
Wyoming Department of Environmental Quality
Wyoming Department of Cmmerce
Wyoming Office of Surface Mining

Local Agencies

Big Horn Conservation District
Big Horn County Commissioners
Big Horn Planning Board
Billings Chamber of Commerce
Bridger Canyon Fire Hall
Broadus Chamber of Commerce
Carbon County Commissioners
Carter County Commissioners
Carter County Conservation District
Custer Fallon County Farm Bureau
Gallatin County Planning Department
Golden Valley County Commissioners
Hardin Chamber of Commerce
Liberty County Conservation
Musselshell County Commissioners
Park County Commissioners
Park County Environmental Council
Powder River County Commissioners
Powder River Conservation District
Rosebud County Conservation District
Rosebud County Commissioners
Rosebud County Extension Agent
Rosebud County Weed District
Sheridan Chamber of Commerce
Sheridan County Commissioners
Sheridan County Planning
Town of Broadus

Distribution List (continued)

Treasure County Commissioners
Yellowstone County Commissioners
Yellowstone County Weed Supervisor

Legislators

Congressional Delegation

U.S. Senator Max Baucus
U.S. Senator John Tester
U.S. Representative Dennis Rehberg

State Legislators

Senators

District 20 – Keith Bales
District 21 – Gerald Pease
District 22 – Lane Larson
District 23 – Kelly Gebhardt
District 24 – Kim Gillan
District 25 – Roy Brown
District 26 – Lynda Moss
District 27 – Corey Stapleton
District 28 – Jeff Essmann
District 29 – Daniel McGee
District 30 – Robert Story
District 31 – John Esp
District 32 – Larry Jent
District 33 – Bob Hawks
District 34 – Joe Balyeat
District 35 – Gary Perry
District 42 – Helena

Representatives

District 39 - Carol Lambert
District 40 – Bill McChesney
District 41 – Norma Bixby
District 42 – Veronica Small-Eastman
District 43 – Duane Ankney
District 44 – William Glaser
District 45 – Alan Olsen
District 46 – Ken Peterson
District 47 – Dennis Himmelberger
District 48 – Wanda Grinde
District 49 – Kendall Van Dyk
District 50 – Tom McGillvray
District 51 – Robyn Driscoll
District 52 – Arlene Becker
District 53 – Elsie Arntzen
District 54 – Gary Branae
District 55 – Michael Lange
District 56 – Ernie Dutton
District 57 – Penny Morgan
District 58 – Krayton Kerns
District 59 – Scott Boggio
District 60 – John Ross
District 61 – Bruce Malcolm
District 62 – Bob Ebinger
District 63 – Jennifer Pomnichowski
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District 65 – Brady Wiseman
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District 68 – Scott Sales
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District 70 – Roger Koopman
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Division of Mineral Resources

Division of Administration

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Official Cooperating Agencies

The following tribes and agencies are Cooperating Agencies who helped prepare the FSEIS.

Tribal

- Crow Tribe of Montana
- Lower Brule Sioux Tribe of the Lower Brule Reservation, South Dakota

Federal

- Bureau of Indian Affairs, Rocky Mountain Regional Office
- U.S. Army Corps of Engineers
- U.S. Department of Energy
- U.S. Environmental Protection Agency, Region VIII

State

- Montana Board of Oil and Gas Conservation
- Montana Department of Environmental Quality

County

- Big Horn County
- Carbon County
- Golden Valley County
- Musselshell County
- Powder River County
- Rosebud County
- Treasure County
- Yellowstone County

List of Preparers (continued)

Invited Cooperators

The following tribes and agencies chose not to become cooperating agencies in the preparation of the SEIS/Amendment.

Tribes

- Fort Peck (Assiniboine and Sioux)
- Northern Cheyenne
- Blackfeet
- Standing Rock Sioux
- Rosebud Sioux
- Pine Ridge Sioux
- Northern Arapahoe
- Fort Belknap (Assiniboine and Gros Ventre)
- Eastern Shoshone
- Chippewa-Cree
- Cheyenne River Sioux
- Rocky Boys

Federal

- U.S. Fish and Wildlife Service
- U.S. Forest Service, Custer National Forest

State

- Montana Department of Natural Resources and Conservation
- Montana Fish, Wildlife, and Parks

County

- Carter County
- Custer County
- Stillwater County
- Sweet Grass County
- Wheatland County

APPENDICES

MONTANA

AIR QUALITY APPENDIX

AIR QUALITY APPENDIX

This appendix contains the Air Quality Modeling Appendix included in the 2003 EIS (Air Quality Modeling Appendix – Part 1) and the Air Quality Modeling Report for the recently (2006) completed air modeling conducted for the SEIS (Air Quality Modeling Appendix - Part 2). The SEIS Air Modeling Appendix - Part 2 contains attachments for information on Health Effects and Mitigation Measures.

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AIR QUALITY MODELING APPENDIX – PART 1

QUANTITATIVE REVIEW OF

AMBIENT AIR QUALITY IMPACTS

Final Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans

Prepared for

U.S. BUREAU OF LAND MANAGEMENT
Miles City Field Office
111 Garryowen Road
Miles City, MT 59301-0940

January 2003

2003 EIS AIR QUALITY MODELING APPENDIX

Air Quality Impact Technical Support Document

The following technical support document describes the processes used to conduct the air quality impact assessment, and provides summaries of relevant analysis data:

Argonne National Laboratory.
2002. Technical Support Document - Air Quality Impact Assessment for the Montana Statewide Final Oil and Gas EIS and Amendment of the Powder River and Billings Resource Management Plans and the Wyoming Final EIS and Planning Amendment for the Powder River Basin Oil and Gas Development Project. Prepared for the U.S. Department of the Interior, Bureau of Land Management, Montana and Wyoming State Offices, by the Environmental Assessment Division, Argonne National Laboratory. Argonne, Illinois.

Copies of this technical support document are available upon request from:

Scott Archer, Senior Air Resource Specialist
National Science and Technology Center (ST-133)
Denver Federal Center, Building 50
P.O. Box 25047
Denver, Colorado 80225-0047
303.236.6400 Voice
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1.0 Introduction

Air pollution impacts are limited by local, state, tribal and federal air quality regulations, standards, and implementation plans established under the CAA and administered by the MDEQ and the EPA. Although not applicable to the proposed Alternatives, the WYDEQ has similar jurisdiction over potential air pollutant emission sources in Wyoming, which can have a cumulative impact with MDEQ approved sources. Air quality regulations require certain proposed new, or modified existing, air pollutant emission sources (including CBM compression facilities) undergo a permitting review before their construction can begin. Therefore, the applicable air quality regulatory agencies have the primary authority and responsibility to review permit applications and to require emission permits, fees and control devices, prior to construction and/or operation.

Fugitive dust and exhaust from construction activities, along with air pollutants emitted during operation (i.e., well operations, field [booster] and sales [pipeline] compressor engines, etc.), are potential causes of air quality impacts. These issues are more likely to generate public concern where natural gas development activities occur near residential areas. The FS, NPS, and the FWS have also expressed concerns regarding potential atmospheric deposition (acid rain) and visibility impacts within distant downwind PSD Class I and PSD Class II areas under their administration, located throughout Montana, Wyoming, southwestern North Dakota, western South Dakota, and northwestern Nebraska.

2.0 Existing Air Quality

As described in **Chapter 3 - Affected Environment (Air Quality)**, specific air quality monitoring is not conducted throughout most of the CBM emphasis area, but air quality conditions are likely to be very good, as characterized by limited air pollution emission sources (few industrial facilities and residential emissions in the relatively small communities and isolated ranches) and good atmospheric dispersion conditions, resulting in relatively low air pollutant concentrations. Air quality monitoring is the appropriate tool for determining compliance with the NAAQS for both particulate matter with an aerodynamic diameter equal to or less than ten microns in diameter (PM_{10}) and nitrogen dioxide (NO_2). As part of the Air Quality Impact Assessment prepared by Argonne National Laboratory (Argonne 2002), monitoring data measured throughout the southeastern Montana and northeastern Wyoming were assembled and reviewed. Although monitoring is primarily conducted in urban or industrial areas, the data selected are considered to be the best available representation of background air pollutant concentrations throughout the CBM emphasis area. Specific values presented in Table AQ-1 were used to define background conditions in the air quality impact analysis. The selected background pollutant concentrations are below applicable ambient air quality standards for all pollutants and averaging times. These National and Montana standards, and the PSD increment values, are also presented in Table AQ-1.

TABLE AQ-1
ASSUMED BACKGROUND CONCENTRATIONS, APPLICABLE AMBIENT AIR QUALITY STANDARDS, AND PSD INCREMENT VALUES (IN (μG/M³)

Pollutant	Averaging Time [a]	Background Concentration	National Ambient Air Quality Standards	Montana Ambient Air Quality Standards	PSD Class I Increment	PSD Class II Increment
Carbon Monoxide	1-hour	15,000	40,000	40,000	N/A	N/A
	8-hours	6,600	10,000	10,000	N/A	N/A
Lead	Quarterly	N/A	1.5	1.5	N/A	N/A
Nitrogen Dioxide	1-hour	117	N/A	566	N/A	N/A
	Annual	11	100	100	2.5	25
Ozone	1-hour	N/A	235	196	N/A	N/A
	8-hours	100	157	N/A	N/A	N/A
$PM_{2.5}$	24-hours	20	65	N/A	N/A	N/A
	Annual	8	15	N/A	N/A	N/A
PM_{10}	24-hours	105	150	150	8	30
	Annual	30	50	50	4	17
Sulfur Dioxide	1-hour	666	N/A	1,300	N/A	N/A
	3-hours	291	1,300	N/A	25	512
	24-hours	73	365	260	5	91
	Annual	16	80	60	2	20

Source: Argonne (2002)
Notes:
$\mu g/m^3$ - micrograms per cubic meter
[a] Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.
N/A – data not available

Note that for evaluating consumption of the PM_{10} and NO_2 increments in Montana and Wyoming, as well as on Indian Reservations, modeling performed by an air quality regulatory agency is the appropriate tool (emissions solely from surface coal mines being the only exception). It should be noted that the BLM model used to identify and analyze impacts in this EIS is not intended or designed to be a regulatory PSD increment consumption modeling process.

Monitoring should be used to supplement modeling efforts, to:

1. Determine if identified levels of concern are exceeded, triggering the need to implement additional mitigation measures in order to avoid regulatory action
2. Provide additional indication of the need for regulatory modeling to determine if increments are being exceeded and an updated State Implementation Plan needed

The States of Wyoming and Montana will work with EPA to develop monitoring plans, which will consider population areas, modeled hot spots and other potential areas of concern. EPA will work with the Crow Tribe and Northern Cheyenne Tribe to identify the need for and to deploy additional monitoring as needed. The EIS predicts that full

development of the Coal Bed Methane resource in Montana, in culmination with non-project and RFFA sources, may generate criteria air pollutants (PM, VOCs and NOx) in sufficient quantities to require regulatory action on the part of MDEQ to protect both the PSD increments and the Montana and National Ambient Air Quality Standards. MDEQ will need to accurately predict the impacts of proposed projects during the New Source Review process and assure that both the ambient standards and the increments are protected. Once projects are up and running MDEQ will also require ambient monitoring data from appropriately sited monitors to verify the permit analysis projections and provide a feedback loop of current ambient data to make sure that future permitting decisions continue to protect the standards and increments. MDEQ can and will require ambient monitoring as a permit condition for major sources.

Additionally, much of the permit analysis for sources of this nature requires good ambient data to accurately predict project impacts. Permitting sources of NO_2 and Ozone (O_3-) precursors (VOCs)~~)~~, requires representative monitoring data to adequately analyze the expected impact of new emissions. Prediction of NO_2 is highly dependent on some knowledge of NO to NO_2 conversion rates. This information is supposed to come from either an analysis of actual NO/NO_2 ratios determined by monitoring results (preferred method), the use of a default value (very conservative and has recently resulted in predicted violations of the annual standard), or by the use of ambient Ozone data to predict conversion rates. Permitting large VOC sources raises similar questions. Ozone analysis requires at least some knowledge of atmospheric chemistry conversion rates in the area of analysis. At this time MDEQ does not have reliable data on the actual chemistry that is occurring in the development area and doesn't have any reliable background Ozone values.

Therefore, MDEQ will need NO/NO_2, O_3 and PM data for the development area from a regionally scaled ambient monitoring station. MDEQ has reviewed the modeling done for the EIS and a monitor sited in the Birney/Ashland area would be the best choice. Provided that funds become available, MDEQ would establish and maintain a monitoring station in this area.

It is important that monitors be deployed before CBM development occurs, or as early in the development cycle as possible, in order to provide baseline information and trend data.

3.0 Regulatory Framework

The National and Montana ambient air quality standards set the absolute upper limits for specific air pollutant concentrations at all locations where the public has access. The analysis of the proposed Alternatives must demonstrate continued compliance with all applicable local, state, tribal and federal air quality standards. Existing air quality throughout most of the CBM emphasis area is in attainment with all ambient air quality standards, as demonstrated by the relatively low concentration levels presented in Table AQ-1. However, three areas have been designated as federal nonattainment areas where the applicable standards have been violated in the past: Lame Deer (PM_{10} - moderate) and Laurel (sulfur dioxide (SO_2) - primary), Montana; and Sheridan, Wyoming (PM_{10} - moderate). Specific monitoring data collected by the Northern Cheyenne Tribe are presented in Table AQ-2.

Air quality regulations require certain proposed new, or modified existing, air pollutant emission sources (including CBM compression facilities) to undergo a permitting review before their construction can begin. Therefore, the applicable air quality regulatory agencies have the primary authority and responsibility to review permit applications and to require emission permits, fees and control devices, prior to construction and/or operation. In addition, the U.S. Congress (through the CAA Section 116) authorized local, state and tribal air quality regulatory agencies to establish air pollution control requirements more (but not less) stringent than federal requirements. Also, for resources discussed in this SEIS, the BLM will not authorize any activity that does not conform to all applicable local, state, tribal and federal air quality laws, regulations, standards, and implementation plans.

Given most the CBM emphasis area's current attainment status, future development projects which have the potential to emit more than 250 tons per year of any criteria pollutant (or certain listed sources that have the potential to emit more than 100 tons per year) would be required to undergo a site-specific regulatory PSD Increment Consumption analysis under the federal New Source Review and permitting regulations. Development projects subject to the PSD regulations may also be required by the applicable air quality regulatory agencies to incorporate additional emission control measures (including a BACT analysis and determination) to ensure protection of air quality resources, and demonstrate that the combined impacts of all PSD sources will not exceed

the allowable incremental air quality impacts for NO_2, PM_{10}, and SO_2.

The NEPA analysis compares potential air quality impacts from the proposed alternatives to applicable ambient air quality standards and PSD increments, but comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern for potential impacts, and do not represent a regulatory PSD Increment Consumption Analysis. Even though most of the development activities would occur within areas designated PSD Class II, the potential impacts on regional Class I areas are to be evaluated. The Montana DEQ will perform the required regulatory PSD increment analysis during the new sources review process. This formal regulatory process will include analysis of impacts on Class I and II air quality areas by existing and proposed emission sources. The activities are not allowed to cause incremental effects greater than the stringent Class I thresholds to occur inside any PSD Class I Area. Stringent emission controls (BACT – Best Available Control Technology) and emission limits may be stipulated in air quality permits as a result of this review, or a permit could be denied.

Sources subject to the PSD permit review procedure are also required to demonstrate potential impacts to air quality related values (AQRV). These include visibility impacts, degradation of mountain lakes from atmospheric deposition (acid rain), and effects on sensitive flora and fauna in the Class I areas. The CAA also provides specific visibility protection procedures for the mandatory federal Class I areas designated by the U.S. Congress on August 7, 1977, which included wilderness areas greater than 5,000 acres in size, and national parks and national memorial parks greater than 6,000 acres in size as of that date. The Fort Peck and Northern Cheyenne tribes have also designated their lands as PSD Class I, although the national visibility regulations do not apply in these areas. The allowable incremental impacts for NO_2, PM_{10}, and SO_2 within these PSD Class I areas are very limited. The remainder of the CBM emphasis area is designated PSD Class II with less stringent requirements.

TABLE AQ-2
AMBIENT AIR QUALITY MONITORING DATA COLLECTED BY THE NORTHERN CHEYENNE TRIBE (IN (µG/M³)

Pollutant	Averaging Time [a]	Year	Morningstar	Garfield Peak	Badger Peak	Lame Deer # 1	Lame Deer # 2	Lame Deer # 3	Lame Deer "PM10A"	Lame Deer "TEOM"
nitrogen dioxide	Annual	1996	5.7	5.7	5.7	N/A	N/A	N/A	N/A	N/A
		1997	5.7	5.7	5.7	N/A	N/A	N/A	N/A	N/A
		1998	5.7	5.7	5.7	N/A	N/A	N/A	N/A	N/A
		1999	5.7	5.7	5.7	N/A	N/A	N/A	N/A	N/A
		2000	5.7	5.7	5.7	N/A	N/A	N/A	N/A	N/A
PM_{10}	Annual	1996	6	N/A	N/A	20	N/A	N/A	N/A	N/A
		1997	N/A	N/A	N/A	18	26	N/A	N/A	N/A
		1998	N/A	N/A	N/A	23	32	32	N/A	N/A
		1999	N/A	N/A	N/A	19	33	32	[22] [b]	32 [b]
		2000	N/A	N/A	N/A	18	29	N/A	17 [b]	28 [b]
		2001	N/A	N/A	N/A	16	36	N/A	N/A	N/A
	24-hours	1996	19	N/A	N/A	120	N/A	N/A	N/A	N/A
		1997	N/A	N/A	N/A	106	75	N/A	N/A	N/A
		1998	N/A	N/A	N/A	55	**153**	**153**	N/A	N/A
		1999	N/A	N/A	N/A	41	106	107	[36] [b]	93 [b]
		2000	N/A	N/A	N/A	40	124	N/A	39 [b]	93 [b]
		2001	N/A	N/A	N/A	33	135	N/A	N/A	N/A

TABLE AQ-2
AMBIENT AIR QUALITY MONITORING DATA COLLECTED BY THE NORTHERN CHEYENNE TRIBE (IN ($\mu G/M^3$)

Pollutant	Averaging Time [a]	Year	Morningstar	Garfield Peak	Badger Peak	Lame Deer # 1	Lame Deer # 2	Lame Deer # 3	Lame Deer "PM10A"	Lame Deer "TEOM"
sulfur dioxide	Annual	1996	2.7	2.7	2.7	N/A	N/A	N/A	N/A	N/A
		1997	2.7	2.7	2.7	N/A	N/A	N/A	N/A	N/A
		1998	2.7	2.7	2.7	N/A	N/A	N/A	N/A	N/A
		1999	2.7	2.7	2.7	N/A	N/A	N/A	N/A	N/A
		2000	2.7	2.7	2.7	N/A	N/A	N/A	N/A	N/A
	24-hours	1996	5.7	5.7	5.7	N/A	N/A	N/A	N/A	N/A
		1997	5.7	5.7	5.7	N/A	N/A	N/A	N/A	N/A
		1998	5.7	5.7	5.7	N/A	N/A	N/A	N/A	N/A
		1999	5.7	5.7	5.7	N/A	N/A	N/A	N/A	N/A
		2000	5.7	5.7	5.7	N/A	N/A	N/A	N/A	N/A
	3-hours	1996	5.2	7.8	5.2	N/A	N/A	N/A	N/A	N/A
		1997	5.2	7.8	5.2	N/A	N/A	N/A	N/A	N/A
		1998	10.4	10.4	10.4	N/A	N/A	N/A	N/A	N/A
		1999	7.8	7.8	5.2	N/A	N/A	N/A	N/A	N/A
		2000	5.2	5.2	5.2	N/A	N/A	N/A	N/A	N/A

Source: EPA (2002b)

Notes: $\mu g/m^3$ - micrograms per cubic meter
N/A - data not available
[a] Short-term averages are reported as the second maximum values.
[b] Supplemental data provided by (Littlewolf 2002).

[data] - data in brackets are not reliable due to the small number of samples collected.

4.0 Agency Roles and Authorities

4.1 Environmental Protection Agency

The Environmental Protection Agency (EPA) administers the Federal Clean Air Act (CAA), (42 U.S.C. 7401 et seq.) to maintain the National Ambient Air Quality Standards (NAAQS) that protect human health and to preserve the rural air quality in the region by assuring the Prevention of Significant Deterioration Class I and Class II increments for SO_2, NO_2, and PM_{10}, are not exceeded. EPA has delegated this CAA authority to the States of Montana and Wyoming.

Until the Tribes have an EPA-approved Tribal program, EPA will administer air quality requirements within Indian country. EPA is responsible for assuring that NAAQS are attained and that the Tribally-designated Northern Cheyenne Class I sensitive airshed is protected, as well as the Class II increment limits that apply on the Crow Reservation. EPA will implement an air permitting program for major sources within Indian country, including BACT analysis, where appropriate. At this time, there is no federal minor source permitting program. Therefore, EPA cannot regulate minor sources in Indian country directly unless EPA decides to implement a Federal Implementation Plan (FIP). Mitigation of particulate emissions from unimproved roads in Indian country may be necessary to protect the Class I and Class II PM_{10} increments.

4.2 Montana DEQ

The MDEQ has been delegated Federal Clean Air Act (CAA) authority from the United States Environmental Protection Agency (EPA) to manage the New Source Review—Prevention of Significant Deterioration (PSD) permit program for listed major sources with the potential to emit (PTE) greater than 100 tons per year (tpy) of any regulated pollutant and all other sources with a PTE greater than 250 tpy of any regulated pollutant. Further, the MDEQ, under the Clean Air Act of Montana (MCA 75-2-101 et seq.) and the Administrative Rules of Montana (ARM) administers a minor source air quality permitting program for sources with a PTE greater than 25 tons per year unless otherwise noted in the ARM. This program requires, among other things, that Best Available Control Technology (BACT) apply to regulated air pollutant emission sources. MDEQ also has delegated responsibility to operate an approved ambient air quality monitoring network for the purpose of demonstrating compliance with the National and Montana Ambient Air Quality Standards (NAAQS/MAAQS).

Currently, the MDEQ imposes a minor source permit limitation on gas compressor engines on a permit-by-permit basis for sources exceeding the Montana minor source permitting threshold (ARM Chapter 17.8, Subchapter 7). Under the authority of ARM 17.8.715, Emission Control Requirements, the MDEQ establishes BACT on a case-by-case basis for natural gas compressor engines, such as those sources indicated for coal bed methane (CBM) development. In general, the Department has required NO_2 emission limits of around 2 grams per brake horsepower hour (g/bhp-hr), a CO emission limit of around 3 g/bhp-hr, and a volatile organic compound (VOC) emission limit of around 1 g/bhp-hr for these sources. Again, as part of the minor source permitting program, Montana applies pollutant specific BACT to compressor engines on a case-by-case basis with limits as described above. However, should future regulatory modeling indicate potential NAAQS/MAAQS or increment consumption exceedances, the MDEQ may require more stringent limits to protect applicable standards.

In addition to the applicable point source BACT emission limits described above, under the authority of ARM 17.8.308, the MDEQ requires that a permitted source use reasonable precautions to limit fugitive particulate emissions from haul roads, access roads, parking lots, or the general plant property. In general, the MDEQ requires that a source have fresh water and/or chemical dust suppressant available on site and used as necessary to maintain compliance with applicable limits, including, but not limited to, the reasonable precautions and opacity limits. Further, the MDEQ could establish more stringent BACT limits for permitted sources and require that counties apply BACM to unimproved roads or other control measures sufficient to avoid exceeding applicable standards and the Class I and Class II increment limits for PM_{10}. Further, the ARM establishes generally applicable air quality rules pertaining to all sources of air pollution, including sources not subject to air quality permitting. These rules include, but are not limited to, the requirements contained in ARM 17.8, Subchapter 1 and ARM 17.8, Subchapter 3.

4.3 Bureau of Indian Affairs

BIA is responsible for approval of any lease, agreement, permit, or document that could encumber lands and minerals owned by either Tribes or allottees. Under the Indian Mineral Development Act (IMDA),

the Secretary of Interior is responsible, based upon BIA recommendation, for approving any contractual arrangement to develop CBM resources. Specific discussion of tribal air quality management issues are addressed separately.

4.4 Bureau of Land Management

NEPA requires that federal agencies consider mitigation of direct and cumulative impacts during their preparation of an EIS. (BLM Land Use Planning Manual 1601.) Prior to approval of Resource Management Plans (RMPs) or Amendments to RMPs, the State Director is to submit any known inconsistencies with State Implementation Plan (SIP) to the Governor of that state. If the Governor of the State recommends changes in the proposed RMP or Amendment to meet SIP requirements, the State Director shall provide the public an opportunity to comment on those recommendations. (BLM Land Use Planning Manual at Section 1610.3-2.)

4.5 Forest Service

The Forest Service administers nine wilderness areas (WAs) that could be affected by direct effects associated with project and non-project sources: Bridger WA; Fitzpatrick WA; North Absaroka, Absaroka-Beartooth, and Washakie WAs, next to Yellowstone NP; Teton WA; U.L. Bend WA; Cloud Peak WA; and Popo Agie WA with mandatory Class I designation. As federal land managers, the Forest Service could act in a consultative role to stipulate that the BLM modeling results, or any future EPA or State-administered PSD refined modeling results (if justified), triggers adverse impairment status. Should the Forest Service determine impairment of WAs, then BLM, the State, and/or EPA may need to mitigate this predicted adverse air quality effect.

4.6 National Park Service

Three areas administered by the National Park Service—Yellowstone National Park, Devils Tower National Monument, and Bighorn Canyon National Recreation Area—could be affected by direct effects associated with project and non-project sources. (Note: Additional Park Service Class I and II areas may be impacted by the non-project sources evaluated, without significant impact from project sources.) As federal land managers, the Park Service could act in a consultative role to stipulate that the BLM modeling results, or any future EPA or State-administered PSD refined modeling results (if justified), triggers adverse impairment status. Should the Park Service determine impairment of NPS-administered Class I areas, then BLM, the State, and/or EPA may need to mitigate this predicted adverse air quality effect.

5.0 Air Quality Management on Tribal Lands

The 1990 Clean Air Act (CAA) Amendments (Section 301(d)) provided tribes the authority to implement CAA programs for their reservations. The Tribal Authority Rule (TAR), promulgated February 12, 1998, reiterates that tribes have direct implementation authority for the CAA. However, until such time as the tribe assumes such responsibility to implement its own program, EPA must implement Federal air quality laws for them. The TAR also requires under §49.11 that EPA promulgate a Federal Implementation Plan (FIP) as necessary or appropriate to protect air quality on the reservations.

EPA has the authority to implement two permitting programs and three source specific programs. EPA has regulatory authority to issue pre-construction permits to major air pollution emissions sources under the Prevention of Significant Deterioration (PSD) program at 40 CFR part 52 and operating permits to major sources under the Title V program at 40 CFR part 71. The PSD program requires that subject sources conduct an air quality analysis to determine the impact on the National Ambient Air Quality Standards (NAAQS) and the PSD increments for NO_2, SO_2, and PM_{10} for three different area classifications (Class I, Class II, and Class III). Under the PSD program, Class I status was assigned to pristine areas, such as national parks and forest lands. Several tribes have been redesignated from a Class II status to a Class I status. The rest of the country is Class II and there are no Class III areas. EPA also has regulatory authority to implement the New Source Performance Standards (NSPS) at 40 CFR part 60, the National Emission Standards for Hazardous Air Pollutants (NESHAP) at 40 CFR part 61, and the Maximum Achievable Control Technology (MACT) standards at 40 CFR part 63.

EPA does not have a rule for a minor source pre-construction permitting program for permitting new and modified sources. A minor source rule is being addressed by the Agency, but such a rule will not be final for 2-3 years. A minor source rule could give EPA the authority to implement a minor source Best Available Control Technology (BACT) requirement for engines. Nor does EPA have a FIP in place for Indian country to address measures for controlling fugitive dust or control technologies for engines.

In 1977, the Northern Cheyenne Indian Tribe's Reservation was redesignated as a Class I airshed under the PSD program. The Tribe has implemented an air quality monitoring program, delivering air quality data to AIRS-AQS since 1981. Currently, the Tribe does not have any EPA approved CAA programs for issuing permits, nor is there a Tribal Implementation Plan (TIP) with general source or source specific requirements or any of the federal NSPS, MACT, or NESHAP standards. At this time, if permitting of major air pollution sources was required, EPA would be the permitting authority.

The Crow Indian Reservation is a Class II airshed. Currently, the Tribe does not have any EPA approved CAA programs for issuing permits, nor is there a TIP with general source or source specific requirements, or any of the federal NSPS, MACT, or NESHAP standards. The Tribe was approved for a CAA Section 103 grant in 2001 to conduct an emissions inventory of the sources on the Reservation. The Tribe is not currently implementing an air quality monitoring program. At this time, if permitting of major air pollution sources were required, EPA would be the permitting authority.

The preferred method to determine the mitigation required to prevent exceedances of ambient air quality standards and to prevent significant deterioration is modeling. EPA will work with the states of Wyoming and Montana along with the tribes to see that, wherever possible, tribal air quality issues are addressed in regional modeling efforts related to coal bed methane development. Additional modeling efforts addressing specific tribal concerns, as necessary, can be undertaken by EPA and the tribal air quality agencies.

Ambient air monitoring can be used to augment and validate modeled results. The Northern Cheyenne Tribe currently conducts ambient air PM_{10} and particulate matter with an aerodynamic diameter equal to or less than 2.5 microns ($PM_{2.5}$) monitoring in the Lame Deer PM_{10} non-attainment area on the Northern Cheyenne Reservation. In order to track the impacts of nearby industrial activities on air quality, the tribe also conducts IMPROVE protocol speciated $PM_{2.5}$ monitoring at the Morningstar site, and PM_{10}, SO_2 and NO_2 monitoring at the Morningstar, Badger Peak and Garfield Peak monitoring stations. These monitoring stations also have collocated meteorological monitors. With updates to emission inventories as a result of coal bed methane development on or outside the Northern Cheyenne Reservation, the monitoring network may need revision or augmentation.

The Crow Tribe does not currently have an air monitoring program and has never had one that submitted data to AIRS-AQS. The Crow tribe has the same rights and potential capabilities as the Northern Cheyenne Tribe. If regional emission increases are sufficient to threaten the NAAQS or other relevant air quality standard on Crow lands, EPA would work with the tribe to encourage them to initiate monitoring activities. To this end, the Tribe can build the capability necessary to conduct ambient air quality monitoring. In the event the tribe chooses not to conduct monitoring, EPA can choose to conduct monitoring using either EPA personnel or contract assistance under Section 301 of the Clean Air Act.

In addition to point source emissions, fugitive dust controls for coal bed methane sources will likely be needed for development on tribal lands. The Tribes can use contractual relationships with developers to require necessary construction phase dust controls on wells on Tribal lands. EPA will work with Tribal, BIA and county agencies as needed to develop and implement necessary mitigation on unpaved roads used for development related traffic.

6.0 Air Quality Impact Assessment

As described in **Chapter 4, Environmental Consequences (Air Quality)**, an extensive air quality impact assessment technical support document was prepared by Argonne National Laboratory (Argonne 2002) and is available for review. Argonne analyzed potential impacts from: individual proposed Alternatives A, B/C/E, and D (project sources); "Non-project" emission sources (existing sources, RFFA and Wyoming PRBO&G Alternative 1; RFFA emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest; and all sources cumulatively by Alternative. Since Alternatives B, C and E have very similar emission inventories, a single air quality impact analysis represents all of these three Alternatives. For example, under Alternative C the number of wells connected to a field (booster) compressor would not be limited but the number was assumed to be the same as in Alternative B, and under Alternative E electrical field (booster) compressors would be required where noise is an issue although all compressors were assumed to be gas-fired.

The air quality impact assessment was based on the best available engineering data and assumptions, meteorology data, and dispersion modeling procedures, as well as professional and scientific judgment. However, where specific data or procedures were not

available, reasonable assumptions were made. Note that these assumptions could result in under or over-estimates of impacts. It is difficult to ascertain the overall bias of the emission estimates and modeling; no sensitivity or probabilities of occurrence analyses were performed.

Air quality impacts for various air pollutants are determined by the use of air dispersion models using specific source emission rates. For natural gas compressors, the emissions of nitrogen oxides are determined by the assumed permitted emission rate allowed by the state. For fugitive dust impacts, emission rates are obtained from EPA's AP-42 document that is titled "Compilation of Air Pollutant Emission Factors". An AP-42 emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Emission factors may be appropriate to use in a number of situations such as making source-specific emission estimates for area-wide inventories. These inventories have many purposes including ambient dispersion modeling and analysis, control strategy development, and in screening sources for compliance investigations. In most cases, these factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all sources in a specific category.

Potential air pollutant emissions from the proposed Alternatives emission sources (denoted as "project" sources) were calculated separately to determine potential impacts. These emissions were then combined with existing sources, proposed non-PRBO&G developments and reasonably foreseeable future actions (RFFA) emissions (denoted as "non-project" sources) and RFFA emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest to determine the total potential cumulative air quality impacts. All of the tables in this Air Quality Modeling Appendix display impacts from: 1) the project sources only; 2) the project sources combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest (denoted as "Project + RFFA Sources); 3) the non-project sources; and 4) cumulative totals.

The non-project sources include development permitted: 1) by the MDEQ; 2) by the WYDEQ; and 3) within the states of North Dakota, South Dakota, and Nebraska; and projections for the Wyoming Powder River Basin Oil and Gas Project DEIS Alternative sources (BLM 2002a); and other RFFA sources from states within the geographic area covered by the model.

Potential direct, indirect and cumulative air quality impacts were analyzed and reported solely under the requirements of NEPA, in order to assess and disclose reasonably foreseeable impacts to both the public and the BLM decision maker before a Record of Decision is issued. Due to the preliminary nature of this NEPA analysis, it should be considered a reasonable estimate of predicted impacts. Actual impacts at the time of development (subject to air pollutant emission source permitting) could be different. To the extent that impacts are predicted to be greater than regulatory thresholds, appropriate mitigation efforts would be undertaken.

Given the lack of representative wind measurements throughout the CBM emphasis area, the EPA CALPUFF dispersion model was used with regional wind speed and direction values derived from the 1996 MM5 (mesoscale model) and CALMET meteorological models (Argonne 2002). Meteorological information was assembled to characterize atmospheric transport and dispersion from several 1996 data sources, including: 36 km gridded MM5 (mesoscale model) values with continuous four-dimensional data assimilation; and hourly surface observations (wind speed, wind direction, temperature, cloud cover, ceiling height, surface pressure, relative humidity, and precipitation.)

Potential air quality impacts were predicted using the EPA CALPUFF dispersion model. The meteorology data and air pollutant emission values were combined to predict maximum potential direct, indirect, and cumulative near-field air quality impacts in the vicinity of assumed well and compressor engine emission sources for comparison with applicable air quality standards and PSD Class II increments. Maximum potential near-field particulate matter emissions from traffic on unpaved roads and during well pad construction were used to predict the maximum annual and 24-hour average $PM_{2.5}$, PM_{10}, and SO_2 impacts. Maximum air pollutant emissions from each CBM well would be temporary (i.e., occurring during a 12-day construction period) and would occur in isolation, without significantly interacting with adjacent well locations. Particulate matter emissions from well pad and resource road construction would be minimized by application of water and/or chemical dust suppressants. The control efficiency of these dust suppressants was computed at 50 per cent during construction. During well completion testing, natural gas could be burned (flared) up to 24 hours.

Air pollutant dispersion modeling was also performed to quantify CO, NO_2, $PM_{2.5}$, PM_{10}, and HAP impacts during operation. Operation emissions would primarily occur due to increased compression requirements, including field (booster) and sales (pipeline) compressor stations. Since produced natural gas is nearly pure methane, with little or no liquid hydrocarbons or sulfur compounds, direct VOC emissions or objectionable odors are not likely to occur. HAP impacts were predicted based on an assumed 9,900 horsepower, six-unit, reciprocating compressor engine station operating at full load with emissions generated by a single stack.

The significance criteria for potential air quality impacts include local, state, tribal and federally enforced legal requirements to ensure air pollutant concentrations will remain within specific allowable levels. These requirements and legal limits were presented in Table AQ-1. Where legal limits have not been established, the BLM uses the best available scientific information to identify thresholds of significant adverse impacts. Thresholds have been identified for hazardous air pollutant (HAP) exposure, potential acid neutralizing capacity (ANC) changes to sensitive lake water chemistry, and a 1.0 dv "just noticeable change" in potential visibility impacts.

Since neither the MDEQ nor EPA have established HAP standards, predicted 8-hour HAP concentrations were compared to a range of 8-hour state maximum Acceptable Ambient Concentration Levels (EPA 1997a). Pollutants which were predicted to exceed these state threshold levels were also analyzed to determine the possible incremental cancer-risk for a most likely exposure (MLE) to residents, and to a maximally exposed individual (MEI), such as compressor station workers. These cancer risks were calculated based on the maximum predicted annual concentrations, EPA's unit risk factors for carcinogenic compounds (EPA 1997b), and an adjustment for time spent at home or on the job.

The EPA CALPUFF dispersion model was also used to determine maximum far-field ambient air quality impacts at downwind mandatory federal PSD Class I areas, and other sensitive receptors, to: 1) determine if the PSD Class I increments might be exceeded; 2) calculate potential total sulfur and nitrogen deposition, and their related impacts to in sensitive lakes; and 3) predict potential visibility impacts (regional haze) within distant sensitive receptors.

Several lakes within five FS designated wilderness areas were identified as being sensitive to atmospheric deposition and for which the most recent and complete data have been collected. The FS (Fox et al. 1989) has identified the following total deposition (wet plus dry) thresholds below which no adverse impacts are likely: five kg/ha-yr for sulfur, and three kg/ha-yr for nitrogen. The FS (2000) has also developed a screening method which identifies the following Limit of Acceptable Change regarding potential changes in lake chemistry: no more than a ten per cent change in ANC for those water bodies where the existing ANC is at or above 25 μeq/l, and no more than a one μeq/l change for those extremely sensitive water bodies where the existing ANC is below 25 μeq/l. No sensitive lakes were identified by either the NPS or FWS.

Since the potential air pollutant emission sources constitute many small sources spread out over a very large area, discrete visible plumes are not likely to impact the distant sensitive areas, but the potential for cumulative visibility impacts (increased regional haze) is a concern. Regional haze degradation is caused by fine particles and gases scattering and absorbing light. Potential changes to regional haze are calculated in terms of a perceptible "just noticeable change" (1.0 dv) in visibility when compared to background conditions. A 1.0 dv change is considered potentially significant in mandatory federal PSD Class I areas as described in the EPA Regional Haze Regulations (40 CFR 51.300 et seq.), and as originally presented in Pitchford and Malm (1994). A 1.0 dv change is defined as about a ten per cent change in the extinction coefficient (corresponding to a two to five per cent change in contrast, for black target against a clear sky, at the most optically sensitive distance from an observer), which is a small but noticeable change in haziness under most circumstances when viewing scenes in mandatory federal Class I areas.

It should be noted that a 1.0 dv change is not a "just noticeable change" in all cases for all scenes. Visibility changes less than 1.0 dv are likely to be perceptible in some cases, especially where the scene being viewed is highly sensitive to small amounts of pollution, such as due to preferential forward light scattering. Under other view-specific conditions, such as where the sight path to a scenic feature is less than the maximum visual range, a change greater than 1.0 dv might be required to be a "just noticeable change." However, this NEPA analysis is not designed to predict specific visibility impacts for specific views in specific mandatory federal PSD Class I areas based on specific project designs, but to characterize reasonably foreseeable visibility conditions that are representative of a fairly broad geographic region, based on reasonable emission source assumptions. This approach is consistent with both the nature of regional haze and the requirements of NEPA. At the time of a pre-construction air quality permit review, the applicable air quality regulatory

agency may require a much more detailed visibility impact analysis. Factors such as the magnitude of change, frequency, time of the year, and the meteorological conditions during times when predicted visibility impacts are above the 1.0 dv threshold (as well as inherent conservatism in the modeling analyses) should all be considered when assessing the significance of predicted impacts.

The FS, NPS and FWS have published their "Final FLAG Phase I Report" (Federal Register, Vol. 66 No. 2, dated January 3, 2001), providing "a consistent and predictable process for assessing the impacts of new and existing sources on AQRVs" including visibility. For example, the FLAG report states "A cumulative effects analysis of new growth (defined as all PSD increment-consuming sources) on visibility impairment should be performed," and further, "If the visibility impairment from the proposed action, in combination with cumulative new source growth, is less than a change in extinction of 10% [1.0 dv] for all time periods, the Federal Land Managers (FLM) will not likely object to the proposed action."

The FLAG report also recommends a two-step analysis process to evaluate potential visibility impacts from either a single proposed air pollutant emission source (the seasonal FLAG screening method) or potential cumulative visibility impacts from a group of air pollutant emission sources (the daily FLAG refined method). As described in Argonne (2002), this NEPA analysis first used the seasonal FLAG screening method (based on both the FLAG and WYDEQ-AQD "natural background" reference levels) to exclude those sensitive areas where visibility impacts were not likely to occur. Since no areas were excluded using the seasonal FLAG screening method, this NEPA analysis then applied the daily FLAG refined method (based on hourly background optical extinction and relative humidity values measured in both the Badlands and Bridger wilderness areas between 1989 and 1999) to determine the average number of days a 1.0 dv "just noticeable change" would be reached annually in each sensitive area. Although the use of observed hourly optical extinction and relative humidity values is appropriate in this NEPA analysis (where the potential visibility impacts are predicted to occur under the Alternatives based on the reasonably foreseeable background conditions), EPA's Regional Haze Regulations are based on optical conditions reconstructed from $PM_{2.5}$ and PM_{10} data collected every third day under the IMPROVE program.

7.0 Modeling Assumptions

When reviewing the predicted near- and far-field air quality impacts, it is important to understand that assumptions were made regarding development, emissions, meteorology, atmospheric transport and chemistry, and atmospheric deposition. For example, there is uncertainty regarding ultimate development (i.e., number of wells, equipment to be used, specific locations of wells, etc.).

The following assumptions were used in the analysis:

- Total predicted short-term air pollutant impact concentrations were assumed to be the sum of the assumed background concentration, plus the predicted maximum cumulative modeled concentrations, which may occur under different meteorological conditions.
- Assumed background air pollution concentrations were assumed to occur throughout the 20-year life of project (LOP) at all locations in the region, even though monitoring is primarily conducted in urban or industrial areas, rather than rural areas. The uniform background PM_{10} levels for each state are assumed to be representative of the background conditions for the entire modeled area of the PRB, based on monitoring data gathered throughout northeastern Wyoming and southeastern Montana.
- The maximum predicted air quality impacts occur only in the vicinity of the anticipated emission sources. Actual impacts would likely be less at distances beyond the predicted points of maximum impact.
- All emission sources were assumed to operate at their reasonably foreseeable maximum emission rates simultaneously throughout the LOP. Given the number of sources included in this analysis, the probability of such a scenario actually occurring over an entire year is small.
- In developing the emissions inventory and model, there is uncertainty regarding ultimate development (i.e., number of wells, equipment to be used, specific locations, etc.) Most (90 per cent) proposed CBM wells and 30 per cent of conventional wells were assumed to be fully operational and remain operating (no shut ins) throughout the LOP.
- The total proposed booster (field) and pipeline (sales) compression engines were assumed to operate at their rated capacities continuously throughout the LOP (no phased increases or

reductions). In reality, compression equipment would be added or removed incrementally as required by the well field operation, compressor engines would operate below full horsepower ratings, and it is unlikely all compressor stations would operate at maximum levels simultaneously.

- The HAP analyses assumed a six-unit, 1,650 hp each, reciprocating compressor engine station would operate at full load and at maximum emission levels continuously throughout the LOP.

- The emissions inventory and model use peak years of construction and peak years of operations, which would not occur throughout the entire development region at the same time. However, these conditions may occur in some areas.

- The emissions inventory and model assumed that a reasonably foreseeable emission rate for compressor engines of 1.5 g/hp-hr of nitrogen oxides (NO_x)is achievable in Montana. Since BACT is decided on a case-by-case basis, actual emission rates could be decided to be less or more than this level by the Departments of Environmental Quality in Montana or Wyoming, and on Indian lands by EPA, for field and sales compressor engines. Reasonable NO_x emission rates may range from 0.7 to 2 g/hp-hr.

- There are no applicable local, state, tribal or federal acid deposition standards. In the absence of applicable standards, the acid deposition analysis assumed that a "limit of acceptable change" is: a 10 per cent change in acid neutralizing capacity (ANC) for lakes with a background ANC greater than 25 μeq/l; or a 1 μeq/l change in ANC for lakes with a background ANC less than 25 μeq/l, and would be a reasonably foreseeable significant adverse impact. Further, the atmospheric deposition impact analysis assumed no other ecosystem components would affect lake chemistry for a full year (assuming no chemical buffering due to interaction with vegetation or soil materials).

- The visibility impact analysis assumed that a 1.0 dv "just noticeable change" would be a reasonably foreseeable significant adverse impact, although there are no applicable local, state, tribal or federal regulatory visibility standards. However, some FLMs are using 0.5 dv as a screening threshold for significance.

- Mitigation measures are included in the emissions inventory and model that may not be achievable in all circumstances. However, actual mitigation decided by the developers and local and state authorities may be greater or less than those assumed in the analysis. For example, maintaining a construction road speed limit of 15 mph may be reasonable in a construction zone but difficult to enforce elsewhere. Full (100%) mitigation of fugitive dust from disturbed lands may not be achievable. Further, 50% reduction in fugitive emissions is assumed based on construction road wetting on the unimproved access road to the pad and at the pad, but this level of effectiveness is characterized as the maximum possible. In the air quality modeling, no specific road wetting or other emissions controls were assumed to be used during the operations phase of the development (e.g., for maintenance vehicle traffic). However, during the review of proposed projects (Applications for Permit to Drill) the BLM would require specific mitigation measures in certain areas during the operational phase of development.

- Induced or secondary growth related to increases in vehicle miles traveled (VMT) (believed to be on the order of 10 per cent overall) is not included in the emissions inventory and model. Not all fugitive dust emissions (including county and other collector roads) have been included in the emissions inventory and model.

- Fugitive dust emissions from roads are treated as area sources rather than line sources in the model, which may thereby reduce or increase the predicted ambient concentrations at maximum concentration receptor points near the source, depending on the inputs to the model (meteorology, terrain, etc.) By not placing modeled receptors close to emission sources (e.g. wells and roads), the model may not capture higher ambient concentrations near these sources. A more refined, regulatory model may yield higher concentrations at locations near fugitive dust sources.

- For comparisons to the PSD Class I and II increments, the emissions inventory and model included only CBM and RFFA sources. Other existing increment consuming sources such as Campbell County, Wyoming coal mines were not included in this comparison, as the air quality analysis does not represent a regulatory PSD increment consumption analysis. A regulatory PSD increment consumption analysis needs to identify and consider all PSD increment consuming sources to determine the level of PSD Class II increment consumption. Monitoring data in Wyoming has indicated an upward trend in PM concentrations in Campbell County since 1999,

which coincides with CBM development but is also exacerbated by prolonged drought in the region.

It is important to note that before actual development could occur, the applicable air quality regulatory agencies (including the state, tribe or EPA) would review specific air pollutant emissions pre-construction permit applications that examine potential project-specific air quality impacts for some source categories. As part of these permit reviews (depending on source size), the air quality regulatory agencies could require additional air quality impact analyses or mitigation measures. Thus, before development occurs, additional site-specific air quality analyses would be performed to ensure protection of air quality.

8.0 Modeling Results

The following Tables present the detailed atmospheric dispersion modeling results which are summarized in **Chapter 4, Environmental Consequences (Air Quality)**.

TABLE AQ-3
PREDICTED HAZARDOUS AIR POLLUTANT IMPACTS AND SIGNIFICANCE THRESHOLDS (IN (μG/M^3)

Pollutant	Averaging Time	Direct Modeled Impact	Range of State Acceptable Ambient Concentration Levels
formaldehyde	8-hours	**11.9**	**4.5** (FL07) - 71 (NV01)
n-hexane	8-hours	0.6	1,800 (FL07) - 36,000 (CT01)
benzene	8-hours	0.7	30 (FL04) - 714 (NV01)
toluene	8-hours	4.6	1,870 (IN03) - 8,930 (NV01)
ethyl benzene	8-hours	< 0.1	4,340 (ND01) - 43,500 (VT01)
xylene	8-hours	0.2	2,170 (IN01) - 10,400 (NV01)

Source: Argonne (2002)

Agencies: CT01 - Connecticut Department of Environmental Protection; Air Compliance Unit
FL04 - Broward County Department of Natural Resource Protection (Florida)
FL07 - Pinellas County Air Pollution Control Board (Florida)
IN01 - Indiana Department of Environmental Management
IN03 - Indianapolis Air Pollution Control Division (Indiana)
ND01 - North Dakota Dept. of Health; Division of Environmental Engineering
NV01 - Nevada Division of Environmental Protection; Air Quality Control
VT01 - Vermont Dept. of Environmental Conservation; Air Pollution Control Division

TABLE AQ-4

ALTERNATIVE A—PREDICTED CRITERIA POLLUTANT IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS (IN (μG/M^3)

Pollutant	Avg Time [a]	Location	PSD Increment	Alt A Project	Non-Project	Cum	Background	Total	NAAQS	MAAQS
carbon monoxide	1-hour	near-field	- - -	49	540	540	15,000	15,540	40,000	26,000
		far-field [1]	- - -	1	100	100	15,000	15,100	40,000	26,000
	8-hours	near-field	- - -	30	311	314	6,600	6,914	10,000	10,000
		far-field [1]	- - -	<1	52	52	6,600	6,652	10,000	10,000
nitrogen dioxide	1-hour	near-field	- - -	21	181	187	117	304	- - -	566
		far-field [1]	- - -	2.0	36	36	117	153	- - -	566
	Annual	near-field	25	1.9	4.8	6.0	11	17	100	100
		far-field [3]	25	1.2	1.1	2.0	11	13	100	100
		far-field [2]	2.5	0.2	0.5	0.7	11	12	100	100
$PM_{2.5}$	24-hours	near-field	- - -	1.0	44.1	44.4	20	64	65	- - -
		far-field [4]	- - -	0.1	12.7	12.7	20	33	65	- - -
	Annual	near-field	- - -	0.3	5.6	5.8	8	14	15	- - -
		far-field [4]	- - -	0.0	1.2	1.2	8	9	15	- - -
PM_{10}	24-hours	near-field	**30** [b]	1.8	**104** [b]	**105** [b]	105	**210** [c]	**150** [c]	**150** [c]
		far-field [4]	30	0.1	29.7	29.7	105	135	150	150
		far-field [2]	**8** [b]	0.5	**8.4** [b]	**8.7** [b]	105	114	150	150
		far-field [5]	8	0.2	7.2	7.4	105	112	150	150
	Annual	near-field	17	0.5	13.1	13.4	30	43	50	50
		far-field [4]	17	0.0	2.7	2.7	30	33	50	50
sulfur dioxide	1-hour	near-field	- - -	1.9	27.4	28.0	666	694	- - -	1,300
		far-field [3]	- - -	1.2	29.6	29.6	666	696	- - -	1,300
	3-hours	near-field	512	1.5	22.6	23.3	291	314	1,300	- - -
		far-field [3]	512	1.0	17.1	17.1	291	308	1,300	- - -
	24-hours	near-field	91	0.9	9.8	10.2	73	83	365	260
		far-field [3]	91	0.6	5.3	5.3	73	78	365	260
	Annual	near-field	20	0.3	1.0	1.1	16	17	80	60
		far-field [3]	20	0.2	0.4	0.4	16	16	80	60

TABLE AQ-4
ALTERNATIVE A—PREDICTED CRITERIA POLLUTANT IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS (IN (µG/M^3)

Pollutant	Avg Time [a]	Location	PSD Increment	Alt A Project	Non-Project	Cum	Background	Total	NAAQS	MAAQS

Source: Argonne (2002)

Notes:
[a] Annual impacts are the first maximum value; short-term impacts are the second maximum value. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.
[b] It is possible that Non-Project and **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation, as well as the PSD Class II increment near the maximum assumed development; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate air quality regulatory agency.
[c] Two receptor locations just south of the Spring Creek Coal Mine when combined with an assumed background concentration of 105 µg/m^2 were predicted to exceed the National and Montana ambient air quality standards due to Non-Project and **Cum** emission sources.

Alt A Project - Direct modeled Alternative A project sources impacts.
Non-Project - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt A**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.
Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt A** Project and Non-Project impacts, which can occur at different locations.
Total - The sum of the cumulative modeled impact and the assumed background concentration.
NAAQS - Applicable National Ambient Air Quality Standard.
MAAQS - Applicable Montana Ambient Air Quality Standard.

Locations:
1 – Absaroka-Beartooth Wilderness Area
2 – Northern Cheyenne Indian Reservation
3 – Crow Indian Reservation
4 – Fort Belknap Indian Reservation
5 – Washakie Wilderness Area

TABLE AQ-5

ALTERNATIVE A - PREDICTED ATMOSPHERIC DEPOSITION IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS

			Total Sulfur Deposition (kg/ha-yr)				Total Nitrogen Deposition (kg/ha-yr)				Acid Neutralizing Capacity (per cent)				
Location	PSD Class	Lake	Alt A Project	Non-Project	Cum	Thld	Alt A Project	Non-Project	Cum	Thld	Bkgd (μeq/l)	Alt A Project	Non-Project	Cum	Thld
Bridger WA	I	Black Joe	<0.01	0.01	0.01	5	<0.01	0.03	0.03	3	69.0	0.1	2.2	2.3	10
		Deep	<0.01	0.01	0.01	5	<0.01	0.03	0.03	3	61.0	0.1	2.5	2.6	10
		Hobbs	<0.01	0.01	0.01	5	<0.01	0.02	0.02	3	68.0	<0.1	1.2	1.3	10
		Upper Frozen	<0.01	0.01	0.01	5	<0.01	0.03	0.03	3	5.8	<0.1 [a]	**1.6** [a]	**1.6** [a]	**1** [a]
Fitzpatrick WA	I	Ross	<0.01	0.01	0.01	5	<0.01	0.02	0.02	3	61.4	0.1	1.7	1.7	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	0.02	0.02	5	<0.01	0.02	0.03	3	27.0	0.1	2.0	2.1	10
		Twin Island	<0.01	0.01	0.02	5	<0.01	0.02	0.03	3	36.0	0.1	1.4	1.5	10
Cloud Peak WA	II	Emerald	<0.01	0.03	0.03	5	<0.01	0.07	0.08	3	53.3	0.2	4.4	4.6	10
		Florence	<0.01	0.03	0.03	5	<0.01	0.08	0.08	3	32.7	0.3	8.1	8.4	10
Popo Agie WA	II	Lower Saddlebag	<0.01	0.01	0.01	5	<0.01	0.03	0.03	3	55.5	0.1	3.2	3.2	10

Source: Argonne (2002)

Notes: **Alt A** Project - Direct modeled Alternative A impacts.

Non-Project - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt A**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.

Cum – Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt A Project** and **Non-Project** impacts. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

Thld – Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from FS (2000).

WA – Wilderness Area.

a - Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 μeq/l, the applicable significance threshold is less than a 1 μeq/l change. This threshold is exceeded by Non-Project and **Cum** emission sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

TABLE AQ-6
ALTERNATIVE A—DAILY FLAG REFINED METHOD—VISIBILITY IMPACT ANALYSIS
(NUMBER OF DAYS Δ1.0 DV PER YEAR)

Sensitive Location	PSD Classification	Alt A Project	Non-Project	Cum
Badlands WA	mandatory federal Class I	0	17 to 25	18 to 25
Bridger WA	mandatory federal Class I	0	8 to 10	8 to 10
Fitzpatrick WA	mandatory federal Class I	0	7 to 9	8 to 10
Gates of the Mountains WA	mandatory federal Class I	0	3 to 4	3 to 4
Grand Teton NP	mandatory federal Class I	0	4 to 6	4 to 6
North Absaroka WA	mandatory federal Class I	0	10 to 12	11 to 12
Red Rock Lakes WA	mandatory federal Class I	0	0 to 1	0 to 1
Scapegoat WA	mandatory federal Class I	0	2 to 2	2 to 3
Teton WA	mandatory federal Class I	0	7 to 9	7 to 10
Theodore Roosevelt NP (North Unit)	mandatory federal Class I	0	1 to 2	1 to 2
Theodore Roosevelt NP (South Unit)	mandatory federal Class I	0	2 to 4	2 to 4
U.L. Bend WA	mandatory federal Class I	0	5 to 5	5 to 6
Washakie WA	mandatory federal Class I	0	11 to 14	12 to 15
Wind Cave NP	mandatory federal Class I	0	21 to 27	22 to 28
Yellowstone NP	mandatory federal Class I	0	9 to 11	9 to 11
Fort Peck IR	Tribal designated Class I	0	1 to 2	2 to 2
Northern Cheyenne IR	Tribal designated Class I	0	30 to 38	33 to 42
Absaroka-Beartooth WA	federal Class II	0	28 to 29	28 to 30
Agate Fossil Beds NM	federal Class II	0	10 to 15	10 to 15
Bighorn Canyon NRA	federal Class II	0	19 to 21	19 to 23
Black Elk WA	federal Class II	0	20 to 26	20 to 26
Cloud Peak WA	federal Class II	0	21 to 28	23 to 30
Crow IR	federal Class II	2	56 to 61	65 to 69
Devils Tower NM	federal Class II	0	24 to 38	26 to 39
Fort Belknap IR	federal Class II	0	60 to 61	61 to 61
Fort Laramie NHS	federal Class II	0	13 to 17	13 to 17

TABLE AQ-6
ALTERNATIVE A—DAILY FLAG REFINED METHOD—VISIBILITY IMPACT ANALYSIS
(NUMBER OF DAYS Δ1.0 DV PER YEAR)

Sensitive Location	PSD Classification	Alt A Project	Non-Project	Cum
Jewel Cave NM	federal Class II	0	24 to 31	24 to 32
Mount Rushmore NMem	federal Class II	0	17 to 22	17 to 22
Popo Agie WA	federal Class II	0	8 to 10	8 to 10
Soldier Creek WA	federal Class II	0	13 to 18	13 to 18

Source: Argonne (2002)

Notes: **Alt A** Project - Direct modeled Alternative 1 impacts.

Non-Project - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt A**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS sources. The range of values corresponds to including Wyoming Alternative 3 (low) to Wyoming Alternative 1 (high).

Cum - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt A** Project and Non-Project impacts, which can occur at different locations. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

Locations:

IR - Indian Reservation.
NHS - National Historic Site.
NM - National Monument
NMem - National Memorial.
NP - National Park.
NRA - National Recreation Area
WA - Wilderness Area.

TABLE AQ-7
ALTERNATIVES B/C/E - PREDICTED CRITERIA POLLUTANT IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS (IN (μG/M^3)

Pollutant	Avg Time [a]	Location	PSD Increment	Alts B/C/E Project	Alts B/C/E Project + RFFA	Non-Project	Cum	Back-ground	Total	NAAQS	MAAQS
carbon monoxide	1-hour	near-field	- - -	109	112.6	540.0	548.2	15,000	15,548	40,000	26,000
		far-field [1]	- - -	6	7.3	100.0	100.0	15,000	15,100	40,000	26,000
	8-hours	near-field	- - -	74	77.2	311.3	337.2	6,600	6,937	10,000	10,000
		far-field [2]	- - -	56	57.8	28.9	78.0	6,600	6,677	10,000	10,000
nitrogen dioxide	1-hour	near-field	- - -	100	102.3	181.0	207.3	117	324.3	- - -	566
		far-field [3]	- - -	58	60.1	27.5	73.3	117	190.3	- - -	566
	Annual	near-field	25	9.1	9.4	4.8	10.7	11	21.7	100	100
		far-field [3]	25	3.9	4.7	1.1	5.4	11	16.4	100	100
		far-field [2]	**2.5[c]**	1.9	**3.7[c]**	0.5	**4.2[c]**	11	15.2	100	100
$PM_{2.5}$	24-hours	near-field	- - -	6.2	6.9	44.1	45.9	20	**65.9 [b]**	**65 [b]**	- - -
		far-field [3]	- - -	4.2	5.1	10.6	14.7	20	34.7	65	- - -
	Annual	near-field	- - -	1.4	1.5	5.6	6.3	8	14.3	15	- - -
		far-field [3]	- - -	0.7	0.8	0.5	1.2	8	9.2	15	- - -
PM_{10}	24-hours	near-field	**30 [c]**	12.1	13.1	**103.8 [c]**	**107.1 [c]**	105	**212.1 [d]**	**150 [d]**	**150 [d]**
		far-field [4]	30	0.3	0.4	29.7	29.7	105	134.7	150	150
		far-field [2]	**8 [c]**	4.2	5.9	**8.4 [c]**	**12.8 [c]**	105	117.8	150	150
		far-field [5]	**8 [c]**	1.4	2.0	7.2	**9.2 [c]**	105	114.2	150	150
	Annual	near-field	17	3.6	3.7	13.1	14.3	30	44.3	50	50
		far-field [4]	17	<0.1	<0.1	2.7	2.7	30	32.7	50	50
sulfur dioxide	1-hour	near-field	- - -	4.6	4.6	27.4	28.2	666	694.2	- - -	1,300
		far-field [3]	- - -	2.2	2.2	29.6	29.6	666	695.6	- - -	1,300
	3-hours	near-field	512	3.5	3.5	22.6	23.6	291	314.6	1,300	- - -
		far-field [3]	512	1.7	1.8	17.1	17.1	291	308.1	1,300	- - -
	24-hours	near-field	91	2.1	2.1	9.8	10.5	73	83.5	365	260
		far-field [3]	91	1.0	1.1	5.3	5.3	73	78.3	365	260
	Annual	near-field	20	0.7	0.7	1.0	1.2	16	17.2	80	60
		far-field [3]	20	0.3	0.3	0.4	0.4	16	16.4	80	60

TABLE AQ-7
ALTERNATIVES B/C/E - PREDICTED CRITERIA POLLUTANT IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS (IN (μG/M^3)

Pollutant	Avg Time [a]	Location	PSD Increment	Alts B/C/E Project	Alts B/C/E Project + RFFA	Non-Project	Cum	Back-ground	Total	NAAQS	MAAQS

Source: Argonne (2002)

Notes:

[a] Annual impacts are the first maximum value; short-term impacts are the second maximum value. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.
[b] Two receptor locations just south of the Spring Creek Coal Mine when combined with an assumed background concentration of 20 $\mu g/m^2$ were predicted to exceed the National ambient air quality standards due to **Cum** emission sources.
[c] It is possible that **Alts B/C/E Project + RFFA**, Non-Project and/or **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation and the Washakie Wilderness Area, as well as the PSD Class II increment near the maximum assumed development; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate air quality regulatory agency.
[d] Two receptor locations just south of the Spring Creek Coal Mine when combined with an assumed background concentration of 105 $\mu g/m^2$ were predicted to exceed the National and Montana ambient air quality standards due to Non-Project and **Cum** emission sources.

Alts B/C/E Project - Direct modeled Alternatives' B/C/E impacts.
Alts B/C/E Project + RFFA - Direct modeled Alternatives' B/C/E impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest.
Non-Project – Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alts B/C/E**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.
Cum – Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alts B/C/E** Project and Non-Project impacts, which can occur at different locations.
Total - The sum of the cumulative modeled impact and the assumed background concentration.
NAAQS – Applicable National Ambient Air Quality Standard.
MAAQS – Applicable Montana Ambient Air Quality Standard.

Locations:
1 – Absaroka-Beartooth Wilderness Area
2 – Northern Cheyenne Indian Reservation
3 – Crow Indian Reservation
4 – Fort Belknap Indian Reservation
5 – Washakie Wilderness Area

TABLE AQ-8
ALTERNATIVES B/C/E - PREDICTED ATMOSPHERIC DEPOSITION IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS

			Total Sulfur Deposition (kg/ha-yr)					Total Nitrogen Deposition (kg/ha-yr)					Acid Neutralizing Capacity (per cent)					
Location	PSD Class	Lake	Alts B/C/E Project	Alts B/C/E Project + RFFA	Non-Project	Cum	Thld	Alts B/C/E Project	Alts B/C/E Project + RFFA	Non-Project	Cum	Thld	Bkgd (μeq/l)	Alts B/C/E Project	Alts B/C/E Project + RFFA	Non-Project	Cum	Thld
Bridger WA	I	Black Joe	<0.01	<0.01	0.01	0.01	5	<0.01	0.01	0.03	0.03	3	69.0	0.3	0.4	2.2	2.6	10
		Deep	<0.01	<0.01	0.01	0.01	5	<0.01	0.01	0.03	0.03	3	61.0	0.3	0.4	2.5	2.9	10
		Hobbs	<0.01	<0.01	0.01	0.01	5	<0.01	<0.01	0.02	0.02	3	68.0	0.2	0.3	1.2	1.5	10
		Upper Frozen	<0.01	<0.01	0.01	0.01	5	<0.01	0.01	0.03	0.03	3	5.8	0.2 [a]	0.25 [a]	**1.6 [a]**	**1.8 [a]**	**1 [a]**
Fitzpatrick WA	I	Ross	<0.01	<0.01	0.01	0.01	5	<0.01	0.01	0.02	0.02	3	61.4	0.3	0.4	1.7	2.1	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	<0.01	0.02	0.02	5	0.01	0.01	0.02	0.03	3	27.0	0.4	0.6	2.0	2.5	10
		Twin Island	<0.01	<0.01	0.01	0.02	5	0.01	0.01	0.02	0.03	3	36.0	0.3	0.4	1.4	1.8	10
Cloud Peak WA	II	Emerald	<0.01	<0.01	0.03	0.03	5	0.02	0.03	0.07	0.10	3	53.3	1.1	1.4	4.4	5.9	10
		Florence	<0.01	<0.01	0.03	0.03	5	0.02	0.03	0.08	0.11	3	32.7	1.7	2.3	8.1	**10.4[b]**	**10[b]**
Popo Agie WA	II	Lower Saddlebag	<0.01	<0.01	0.01	0.01	5	<0.01	0.01	0.03	0.04	3	55.5	0.3	0.5	3.2	3.6	10

Source: Argonne (2002)

Notes: **Alts B/C/E** Project - Direct modeled Alternatives' B/C/E impacts.

Alts B/C/E Project + RFFA - Direct modeled Alternatives' B/C/E impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest

Non-Project - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alts B/C/E**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alts B/C/E** Project and Non-Project impacts. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

Thld - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from FS (2000).

WA - Wilderness Area.

a - Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 μeq/l, the applicable significance threshold is less than a 1 μeq/l change. This threshold is exceeded by Non-Project and **Cum** emission sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

b – The potential cumulative impact of 10.4 μeq/l change would exceed the threshold level of 10 μeq/l for Florence Lake.

TABLE AQ-9
ALTERNATIVES B/C/E - DAILY FLAG REFINED METHOD - VISIBILITY IMPACT ANALYSIS
(NUMBER OF DAYS Δ1.0 DV PER YEAR)

Sensitive Location	PSD Classification	Alts B/C/E Project	Alts B/C/E Project + RFFA	Non-Project	Cum
Badlands WA	mandatory federal Class I	0	0	17 to 25	21 to 28
Bridger WA	mandatory federal Class I	2	3	8 to 10	10 to 12
Fitzpatrick WA	mandatory federal Class I	2	3	7 to 9	10 to 12
Gates of the Mountains WA	mandatory federal Class I	0	0	3 to 4	4 to 4
Grand Teton NP	mandatory federal Class I	0	0	4 to 6	6 to 8
North Absaroka WA	mandatory federal Class I	2	4	10 to 12	13 to 15
Red Rock Lakes WA	mandatory federal Class I	0	0	0 to 1	2 to 3
Scapegoat WA	mandatory federal Class I	0	0	2 to 2	3 to 3
Teton WA	mandatory federal Class I	1	3	7 to 9	10 to 11
Theodore Roosevelt NP (North Unit)	mandatory federal Class I	0	0	1 to 2	2 to 3
Theodore Roosevelt NP (South Unit)	mandatory federal Class I	0	1	2 to 4	4 to 7
U.L. Bend WA	mandatory federal Class I	1	1	5 to 5	6 to 8
Washakie WA	mandatory federal Class I	3	5	11 to 14	16 to 18
Wind Cave NP	mandatory federal Class I	0	0	21 to 27	25 to 32
Yellowstone NP	mandatory federal Class I	1	3	9 to 11	12 to 13
Fort Peck IR	Tribal designated Class I	0	1	1 to 2	4 to 5
Northern Cheyenne IR	Tribal designated Class I	33	60	30 to 38	87 to 92
Absaroka-Beartooth WA	federal Class II	2	4	28 to 29	32 to 33
Agate Fossil Beds NM	federal Class II	0	0	10 to 15	14 to 19
Bighorn Canyon NRA	federal Class II	9	17	19 to 21	32 to 34
Black Elk WA	federal Class II	0	1	20 to 26	24 to 31
Cloud Peak WA	federal Class II	6	10	21 to 28	35 to 39
Crow IR	federal Class II	61	75	56 to 61	113 to 116

TABLE AQ-9
ALTERNATIVES B/C/E - DAILY FLAG REFINED METHOD - VISIBILITY IMPACT ANALYSIS (NUMBER OF DAYS Δ1.0 DV PER YEAR)

Sensitive Location	PSD Classification	Alts B/C/E Project	Alts B/C/E Project + RFFA	Non-Project	Cum
Devils Tower NM	federal Class II	1	3	24 to 38	34 to 47
Fort Belknap IR	federal Class II	1	1	60 to 61	61 to 62
Fort Laramie NHS	federal Class II	0	1	13 to 17	16 to 20
Jewel Cave NM	federal Class II	0	0	24 to 31	28 to 36
Mount Rushmore NMem	federal Class II	0	0	17 to 22	20 to 26
Popo Agie WA	federal Class II	2	3	8 to 10	11 to 13
Soldier Creek WA	federal Class II	0	0	13 to 18	16 to 21

Source: Argonne (2002)

Notes: **Alts B/C/E Project** - Direct modeled Alternatives' B/C/E impacts.

Alts B/C/E Project + RFFA - Direct modeled Alternatives' B/C/E impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest.

Non-Project - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alts B/C/E**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS sources. The range of values corresponds to including Wyoming Alternative 3 (low) to Wyoming Alternative 1 (high).**Cum** - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alts B/C/E** Project and Non-Project impacts, which can occur at different locations. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

Locations:

IR - Indian Reservation. **NHS** - National Historic Site. **NM** - National Monument

NMem - National Memorial. **NP** - National Park. **NRA** - National Recreation Area

WA - Wilderness Area.

TABLE AQ-10
ALTERNATIVE D - PREDICTED CRITERIA POLLUTANT IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS (IN (μG/M^3)

Pollutant	Avg Time [a]	Location	PSD Increment	Alt D Project	Alt D Project + RFFA	Non-Project	Cum	Back-ground	Total	NAAQS	MAAQS
carbon monoxide	1-hour	near-field	- - -	48	47.7	540	540.8	15,000	15,541	40,000	26,000
		far-field [1]	- - -	2	2.2	100	100.0	15,000	15,100	40,000	26,000
	8-hours	near-field	- - -	29	29.6	311.3	319.8	6,600	6,920	10,000	10,000
		far-field [1]	- - -	1	1.8	52	51.8	6,600	6,652	10,000	10,000
nitrogen dioxide	1-hour	near-field	- - -	50	59.6	181	195.1	117	312.1	- - -	566
		far-field [3]	- - -	33	32.7	27.5	43.9	117	160.1	- - -	566
	Annual	near-field	25	6.4	6.5	4.8	7.8	11	18.814.	100	100
		far-field [3]	25	2.4	2.8	1.1	3.5	11	5	100	100
		far-field [2]	2.5	1.1	2.0	0.5	**2.5**[e]	11	13.5	100	100
$PM_{2.5}$	24-hours	near-field	- - -	4.3	4.7	44.1	45.3	20	**65.3** [b]	**65** [b]	- - -
		far-field [3]	- - -	2.6	2.9	10.6	12.8	20	32.8	65	- - -
	Annual	near-field	- - -	1.2	1.2	5.6	6.0	8	14.0	15	- - -
		far-field [4]	- - -	<0.1	<0.1	1.2	1.2	8	9.2	15	- - -
PM_{10}	24-hours	near-field	**30** [c]	10.8	11.5	**103.8** [c]	**106.5** [c]	105	**211.5** [d]	**150** [d]	**150** [d]
		far-field [4]	30	0.1	0.2	29.7	29.7	105	134.7	150	150
		far-field [2]	**8** [c]	3.3	4.4	**8.4** [c]	**11.1** [c]	105	116.1	150	150
		far-field [5]	**8** [c]	0.6	0.9	7.2	**8.1** [c]	105	113.1	150	150
	Annual	near-field	17	3.3	3.4	13.1	14.1	30	44.1	50	50
		far-field [4]	17	<0.1	<0.1	2.7	2.7	30	32.7	50	50
sulfur dioxide	1-hour	near-field	- - -	4.5	4.5	27.4	28.2	666	694.2	- - -	1,300
		far-field [3]	- - -	2.2	2.2	29.6	29.6	666	695.6	- - -	1,300
	3-hours	near-field	512	3.5	3.5	22.6	23.6	291	314.6	1,300	- - -
		far-field [3]	512	1.7	1.8	17.1	17.1	291	308.1	1,300	- - -
	24-hours	near-field	91	2.1	2.1	9.8	10.5	73	83.5	365	260
		far-field [3]	91	1.0	1.1	5.3	5.3	73	78.3	365	260
	Annual	near-field	20	0.7	0.7	1.0	1.2	16	17.1	80	60
		far-field [3]	20	0.3	0.3	0.4	0.4	16	16.4	80	60

Source: Argonne (2002)

Notes: [a] Annual impacts are the first maximum value; short-term impacts are the second maximum value. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

[b] Two receptor locations just south of the Spring Creek Coal Mine when combined with an assumed background concentration of 20 $\mu g/m^2$ were predicted to exceed the National ambient air quality standards due to **Cum** emission sources.

[c] It is possible that Non-Project and/or **Cum** emission sources could exceed the PSD Class I increment on the Northern Cheyenne Indian Reservation and Washakie Wilderness Area, as well as the PSD Class II increment near the maximum assumed development; a regulatory "PSD Increment Consumption Analysis" should be conducted during permitting by the appropriate air quality regulatory agency.

[d] Two receptor locations just south of the Spring Creek Coal Mine when combined with an assumed background concentration of 105 $\mu g/m^2$ were predicted to exceed the National and Montana ambient air quality standards due to **Cum** emission sources.

[e] Actual model results equal to 2.45 $\mu g/m^3$. See Argonne (2002) Appendix C, Table C.1.2.3.

Alt D Project - Direct modeled Alternative D impacts.

Alts D Project + RFFA - Direct modeled Alternatives' D impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest.

Non-Project - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt D**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.

Cum – Cumulative modeled impacts. Since these values represent the maximum cumulative impact location, they may not be a simple sum of the maximum direct **Alt D** Project and Non-Project impacts, which can occur at different locations.

Total - The sum of the cumulative modeled impact and the assumed background concentration.

NAAAQS - Applicable National Ambient Air Quality Standard.

MAAQS - Applicable Montana Ambient Air Quality Standard.

Locations:

1 – Absaroka-Beartooth Wilderness Area

2 – Northern Cheyenne Indian Reservation

3 – Crow Indian Reservation

4 – Fort Belknap Indian Reservation

5 – Washakie Wilderness Area

TABLE AQ-11
ALTERNATIVE D - PREDICTED ATMOSPHERIC DEPOSITION IMPACTS AND APPLICABLE SIGNIFICANCE THRESHOLDS

			Total Sulfur Deposition (kg/ha-yr)					Total Nitrogen Deposition (kg/ha-yr)					Acid Neutralizing Capacity (per cent)					
Location	PSD Class	Lake	Alt D Project	Alt D Project + RFFA	Non-Project	Cum	Thld	Alt D Project	Alt D Project + RFFA	Non-Project	Cum	Thld	Bkgd (μeq/l)	Alt D Project	Alt D Project + RFFA	Non-Project	Cum	Thld
Bridger WA	I	Black Joe	<0.01	<0.01	0.01	0.01	5	<0.01	<0.01	0.03	0.03	3	69.0	0.2	0.2	2.2	2.4	10
		Deep	<0.01	<0.01	0.01	0.01	5	<0.01	<0.01	0.03	0.03	3	61.0	0.2	0.2	2.5	2.7	10
		Hobbs	<0.01	<0.01	0.01	0.01	5	<0.01	<0.01	0.02	0.02	3	68.0	0.1	0.2	1.2	1.4	10
		Upper Frozen	<0.01	<0.01	0.01	0.01	5	<0.01	<0.01	0.03	0.03	3	5.8	0.1 [a]	0.13 [a]	**1.6** [a]	**1.7** [a]	**1** [a]
Fitzpatrick WA	I	Ross	<0.01	<0.01	0.01	0.01	5	<0.01	<0.01	0.02	0.02	3	61.4	0.2	0.2	1.7	1.9	10
Absaroka-Beartooth WA	II	Stepping Stone	<0.01	<0.01	0.02	0.02	5	<0.01	0.01	0.02	0.03	3	27.0	0.3	0.3	2.0	2.3	10
		Twin Island	<0.01	<0.01	0.01	0.02	5	<0.01	0.01	0.02	0.03	3	36.0	0.2	0.2	1.4	1.6	10
Cloud Peak WA	II	Emerald	<0.01	<0.01	0.03	0.03	5	0.01	0.02	0.07	0.09	3	53.3	0.6	0.7	4.4	5.2	10
		Florence	<0.01	<0.01	0.03	0.03	5	0.01	0.02	0.08	0.09	3	32.7	0.9	1.1	8.1	9.2	10
Popo Agie WA	II	Lower Saddlebag	<0.01	<0.01	0.01	0.01	5	<0.01	<0.01	0.03	0.03	3	55.5	0.2	0.2	3.2	3.4	10

Source: Argonne (2002)

Notes: **Alt D** Project - Direct modeled Alternative D impacts.

Alts D Project + RFFA - Direct modeled Alternatives' D impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest.

Non-Project - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt D**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS Alternative 1 sources. Potential impacts from Wyoming Alternatives 2A, 2B and 3 would be less.

Cum - Cumulative modeled impacts. Since these values represent the maximum cumulative impact at a specific location, they are the sum of the maximum direct **Alt D** Project and Non-Project impacts. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

Thld - Impact threshold. Total sulfur and nitrogen thresholds from Fox, et al. (1989); acid neutralizing capacity thresholds from FS (2000).

WA - Wilderness Area.

a - Since the background acid neutralizing capacity at Upper Frozen Lake is less than 25 μeq/l, the applicable significance threshold is less than a 1 μeq/l change. This threshold is exceeded by Non-Project and **Cum** emission sources. However, the background concentration is based on only six samples taken on four days between 1997 and 2001.

TABLE AQ-12
ALTERNATIVE D - DAILY FLAG REFINED METHOD - VISIBILITY IMPACT ANALYSIS (NUMBER OF DAYS >1.0 DV PER YEAR)

Sensitive Location	PSD Classification	Alt D Project	Alt D Project + RFFA	Non-Project	Cum
Badlands WA	mandatory federal Class I	0	0	17 to 25	20 to 26
Bridger WA	mandatory federal Class I	0	1	8 to 10	9 to 11
Fitzpatrick WA	mandatory federal Class I	0	0	7 to 9	8 to 10
Gates of the Mountains WA	mandatory federal Class I	0	0	3 to 4	3 to 4
Grand Teton NP	mandatory federal Class I	0	0	4 to 6	5 to 7
North Absaroka WA	mandatory federal Class I	0	1	10 to 12	12 to 14
Red Rock Lakes WA	mandatory federal Class I	0	0	0 to 1	1 to 2
Scapegoat WA	mandatory federal Class I	0	0	2 to 2	2 to 3
Teton WA	mandatory federal Class I	0	0	7 to 9	9 to 10
Theodore Roosevelt NP (North Unit)	mandatory federal Class I	0	0	1 to 2	1 to 2
Theodore Roosevelt NP (South Unit)	mandatory federal Class I	0	0	2 to 4	3 to 5
U.L. Bend WA	mandatory federal Class I	0	0	5 to 5	5 to 6
Washakie WA	mandatory federal Class I	1	1	11 to 14	14 to 16
Wind Cave NP	mandatory federal Class I	0	0	21 to 27	23 to 29
Yellowstone NP	mandatory federal Class I	0	0	9 to 11	11 to 12
Fort Peck IR	Tribal designated Class I	0	0	1 to 2	2 to 3
Northern Cheyenne IR	Tribal designated Class I	17	38	30 to 38	70 to 76
Absaroka-Beartooth WA	federal Class II	0	1	28 to 29	30 to 31
Agate Fossil Beds NM	federal Class II	0	0	10 to 15	12 to 17
Bighorn Canyon NRA	federal Class II	3	7	19 to 21	2 to 28
Black Elk WA	federal Class II	0	0	20 to 26	22 to 28
Cloud Peak WA	federal Class II	1	2	21 to 28	28 to 35
Crow IR	federal Class II	42	56	56 to 61	102 to 105
Devils Tower NM	federal Class II	0	0	24 to 38	29 to 42

TABLE AQ-12
ALTERNATIVE D - DAILY FLAG REFINED METHOD - VISIBILITY IMPACT ANALYSIS (NUMBER OF DAYS >1.0 DV PER YEAR)

Sensitive Location	PSD Classification	Alt D Project	Alt D Project + RFFA	Non-Project	Cum
Fort Belknap IR	federal Class II	0	0	60 to 61	61 to 61
Fort Laramie NHS	federal Class II	0	0	13 to 17	15 to 18
Jewel Cave NM	federal Class II	0	0	24 to 31	26 to 34
Mount Rushmore NMem	federal Class II	0	0	17 to 22	18 to 23
Popo Agie WA	federal Class II	0	1	8 to 10	9 to 11
Soldier Creek WA	federal Class II	0	0	13 to 18	14 to 20

Source: Argonne (2002)

Notes: **Alt D** Project - Direct modeled Alternative D impacts.
Alts D Project + RFFA - Direct modeled Alternatives' D impacts combined with emissions from potential CBM development on the Northern Cheyenne and Crow Indian Reservations and the Ashland District of the Custer National Forest.
Non-Project - Direct modeled non-project source impacts. The impact from all air pollutant emission sources not included in **Alt D**, including the Wyoming "Powder River Basin Oil and Gas Project" DEIS sources. The range of values corresponds to including Wyoming Alternative 3 (low) to Wyoming Alternative 1 (high).
Cum - Cumulative modeled impacts. Since these values represent the maximum visibility impact anywhere within the sensitive location, they may not be a simple sum of the maximum direct **Alt D** Project and Non-Project impacts, which can occur at different locations. There are uncertainties, unquantified at this point, associated with the modeled values. Actual maximum impacts may be larger or smaller than those shown.

Locations:
IR - Indian Reservation. **NHS** - National Historic Site. **NM** - National Monument
NMem - National Memorial. **NP** - National Park. **NRA** - National Recreation Area
WA - Wilderness Area.

9.0 Thresholds For Triggering Mitigation

9.1 Clean Air Act Regulatory Thresholds

For Prevention of Significant Deterioration (PSD) of air quality, modeled and monitored results for $PM_{10}$and NO_2 will be evaluated against the Class I and Class II increments to determine if additional mitigation will be required (see Table AQ-1).

Monitoring data only will be used to determine if the NAAQS PM_{10} and NO_2 standards (see Table AQ-1) have been exceeded. For federal lands with Class I areas, the Clean Air Act sets a 60-year goal of clear vistas. Clear vistas are defined as reduction in visibility not to exceed 1.0 deciview/year for more than 1 day. Where this threshold is exceeded from a single project, this could be the basis for the federal land managers' designation of visibility impairment. Such a designation could necessitate mitigation. Where the threshold is exceeded based on cumulative actions (i.e. RFFA), this also could be the basis for the federal land managers' designation of visibility impairment. In this instance, Congress directed federal land managers to implement mitigation pursuant to the Regional Haze Rule, in a manner that results in a 25% reduction in impairment every 15-year period to meet the 60-year clear vistas goal.

In order to prevent violations of national and local air quality standards, emission controls need to be implemented before standards are violated. For an analytic approach, implementation of control adequate to lead to no predicted cumulative violations are adequate, since all known and anticipated emissions will presumably be modeled within model uncertainties. NO_2 modeling of this well understood gas should be accurate enough to base mitigation decisions.

9.2 "Levels of Concern"

If mitigation measures are not fully implemented until regulatory thresholds are exceeded, then a regulatory process is triggered to resolve the exceedances. Such a process may be lengthy, costly and administratively burdensome. Agencies may wish to avoid such a process by establishing a "level of concern" short of regulatory thresholds, which would trigger implementation of control measures of a type and quantity sufficient to avoid reaching regulatory thresholds.

Where predictive capability is well-developed, as is the case with modeling of NO_2, an LOC might more closely approach the regulatory threshold. However, with a pollutant such as PM_{10}, greater uncertainties exist in the prediction of ambient concentrations due to such factors as differential particle settling. In such a case, an LOC may need to be established at a lower level to achieve the objective of avoiding regulatory exceedances.

9.3 Mitigation Measures

If air quality mitigation applied by all parties in the Powder River Basin are proven to be inadequate, cumulatively, to maintain these Class I and Class II increment limits based on regulatory air quality modeling or monitored conditions, Montana, Wyoming, or the Tribes may impose either a State or Tribal Implementation Plan (SIP or TIP) to assure preservation of the rural air quality. EPA may itself impose a Federal Implementation Plan (FIP) to obtain controls on all regulated pollutant emission sources in order to assure preservation of the rural air quality.

9.4 Mitigation

Tables AQ-13 and AQ-14 include the array of measures available to mitigate potential PM_{10} and NO_x impacts and the effectiveness of each measure.

TABLE AQ-13
FUGITIVE DUST MITIGATION MEASURES (PM10), EFFECTIVENESS AND COST

	Dust Sources					
	Disturbed Areas	**Unpaved Roads[1]**				
Mitigation Options	Establish plant cover for all disturbed lands by certain time (re-vegetation)	Water roads to attain certain percent moisture	Apply soil stabilizer	Set and enforce speed limit	Gravel roads	Pave road
Effectiveness	Level proportional to percentage of land cover	0 – 50% reduction in uncontrolled dust emissions	33 to 100% control efficiency	80% for 15 mph 65% for 20 mph 25% for 30 mph [2]	30% reduction	90% reduction
Estimated Cost	$/acre	$4000/mile	$2,000 to $4,000/mile per year	Unknown	$9,000/mile	$11,000 to $60,000/mile

[1]Improved and County roads
[2]Reductions assume 40 mile per hour base speed.

TABLE AQ-14
NITROGEN OXIDES (NOX) MITIGATION MEASURES EFFICIENCY

	No_x Emissions Sources[1]			
	Field Compressors	**Sales Compressors**	**Temporary Diesel Generators [2]**	**Heavy Equipment**
Mitigation Options/Efficiency	Implement Best Available Control Technology Typically results in a NO_x emission rate of about 1 g/bhp-hr	Implement Best Available Control Technology Typically results in a NO_x emission rate of about 1 g/bhp-hr	Register with State; will regulate as appropriate	Voluntary use of diesel engines

1 Using electric – powered compressor motors in place of the typical natural-gas fired compressor engines could eliminate direct NO_x emissions from compressor station locations.

[2]Wyoming is currently registering these generators to determine if No_X emissions are significant.

AIR QUALITY MODELING APPENDIX – PART 2

QUANTITATIVE REVIEW OF

AMBIENT AIR QUALITY IMPACTS

Supplement to Statewide Final Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans

Prepared for

U.S. BUREAU OF LAND MANAGEMENT
Miles City Field Office
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November 2006

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1.0 INTRODUCTION AND BACKGROUND

The Powder River Basin (PRB) of Montana and Wyoming is a major coal resource region in the United States. It has also produced large quantities of natural gas and oil, and has experienced significant development of coal bed natural gas from its coal seams. The region also has a diverse set of environmental values, including proximity to some of the most pristine areas in the United States. Sensitive areas that were evaluated include the identified Class I areas, for air quality regulatory purposes, and other selected Class II sensitive areas, based on previous studies of coal development and coal bed natural gas development in the region.

A Montana Statewide Oil and Gas Environmental Impact Statement (EIS) had been developed in January 2003. This report provides a supplemental analysis of potential impacts related to air quality for Coal Bed Natural Gas Development in the Powder River Basin area. The potential air quality impacts have recently been analyzed as part of two different studies:

- Final Statewide Oil and Gas Environmental Impact Statement and Proposed Amendment of the Powder River and Billings Resource Management Plans, prepared by the Bureau of Land Management Miles City Field Office and the Billings Field Office, and the State of Montana Board of Oil and Gas Conservation and the Montana Department of Environmental Quality (BLM and Montana, 2003); The bulk of the technical review was based on data included in the Technical Support Document (Argonne 2002) that was applied to both the Montana Statewide Oil and Gas EIS, and;
- Task 1A and 3A Reports for the Powder River Basin Coal Review, Cumulative Air Quality Effects, prepared for the BLM Casper Field Office, and the Wyoming State Office (ENSR 2005a, b).

A series of dispersion modeling exercises were conducted for each of the cited studies and analyses. In this report, the studies will be referred to as the Oil and Gas EIS and the Coal Review, respectively. Additional impact analyses have been carried out for the Tongue River Railroad expansion and the Proposed Roundup Power Plant in Musselshell County, Montana. The results of these proposed projects are also incorporated into this report.

This study provides a further evaluation of the air quality-related environmental impacts of continued development of coal bed natural gas resources in the region. The evaluation includes estimating emissions and potential impacts for a base year (2004), and estimating comparative potential impacts for peak development for three separate development scenarios. This report describes the emissions development, summarizes those data, discusses the modeling efforts, and presents results for the base year and alternative development plans.

The purpose of the study was to evaluate the regional changes in air quality potential impacts resulting from three separate development scenarios. The study is not designed to provide specific air permitting data for a specific project. The focus is on potential impacts in the Powder River Basin "region," which is characterized as the near-field grid, and on the sensitive receptor groups surrounding the region. Details of the analysis are provided for all groups, but emphasized for the near-field and for the sensitive areas that have the highest modeled potential impacts from the sources in the region.

Finally, a word should be said regarding dispersion modeling analyses and their use in planning and decision-making. All dispersion models, regardless of their level of complexity, are mathematical approximations (based largely on fluid dynamics) of the behavior of the atmosphere. Therefore, particularly given the uncertain nature of the number and placement of the RFD Alternative sources used in this analysis, the results need to be viewed appropriately as estimates of possible future concentrations and not exact predictions in time and space.

Because of this, dispersion modeling is generally conducted in a somewhat conservative manner, attempting to insure that the final results do not underestimate the actual or future impacts, so that appropriate planning decisions can be made. For example, sources may be assumed to operate for longer times or emit more pollutants than might be reasonable to expect to insure that health-based air standards are protected. On the other hand, analyses are not conducted assuming the worst-case conditions across the board, which could lead to a "false-positive" result. Hence, dispersion modeling analyses are a balancing act, using the best available information and methods (EPA-approved models, emission factors, etc.) when possible, and the best scientific and professional judgment otherwise, trying to shade the analysis so that the final results do not under-predict the actual concentrations.

Oil and Gas EIS

The Oil and Gas EIS included evaluations of the full range of environmental issues for development in the Montana and Wyoming Project Areas. Figure 1-1 depicts the EIS study area and the receptor grids. For comparison to this study, the EIS included three separate model runs to address potential impacts on air quality for several development alternatives that included no action, a preferred development alternative, and three other alternatives that addressed varying development limitations or emphases. The study addressed potential impacts from project sources and from non-project sources in a five-state region. It predicted potential impacts on ambient air quality standards (NO_2, SO_2, PM_{10}, $PM_{2.5}$, and CO), PSD Class I increments, sulfur and nitrogen deposition, visibility in Class I areas, and potential impacts on sensitive lakes.

Among the analyzed alternatives, the common cumulative impacts for all alternatives included potential exceedances of the 24-hour PM_{10} standard in the near-field receptors in Montana. The exceedances were generally due to PM_{10} sources near mining operations; however, the method of analysis was not sufficiently detailed to provide a regulatory estimate of actual exceedances. The EIS analysis also reviewed PSD increments and noted potential impacts above the PSD levels, but did not specifically sort PSD increment consuming sources into their specific potential impacts The EIS noted that potential impacts among the alternatives are generally similar (Alternatives B, C, and E were stated to have similar potential impacts). The potential impacts of the alternatives under consideration were generally below applicable standards and increments, as well as having minimal potential impacts on visibility and acid deposition. The potential impacts of concern resulted from cumulative impacts of non-project sources that were analyzed in the study. All alternatives cumulative modeling showed visibility impacts at Class I areas, with the greatest potential impacts at the Northern Cheyenne Indian Reservation. Among the Class II areas reviewed, greatest potential impacts were at the Crow Indian Reservation, just west of the Northern Cheyenne Indian Reservation.

The Oil and Gas EIS identified existing air quality conditions in the region at the Morningstar, Badger Peak, and Lame Deer monitoring sites. The summary stated that The Oil and Gas EIS first identified existing air quality conditions in the region at the Morningstar, Badger Peak, and Lame Deer monitoring sites. The summary further stated that one monitor has shown that some 24-hour PM_{10} potential impacts exceed the ambient air quality standard of 150 $\mu g/m^3$, specifically at the Lame Deer monitoring site on the Northern Cheyenne Indian Reservation. Additionally, modeled near-field potential impacts in Wyoming showed the possibility of exceedances of the 24-hour PM_{10} standard and Class II PSD increments. Air quality levels of NO_2 and SO_2 were well below the ambient standards at all monitoring sites in the region.

The key emissions input data were based on emissions from the proposed alternatives along with other selected non-alternative sources in the region. A review of the database used in the study prepared by Argonne National Labs (Argonne 2002) indicated that actual emissions data that were modeled included: those sources operating after the monitoring period used to establish baseline air quality conditions; the changes in emission rates for some existing projects associated with the period of development of any of the alternatives; and project RFD scenarios and reasonably foreseeable future actions. Only those sources with changes in emissions, as reported by regulatory agencies, including WDEQ were included in the modeling. As a result, the modeling effort focused on potential impacts from new and altered permitted sources in the region. A series of alternatives was evaluated including Alternative A (which projected limited development under existing management prescriptions) and Alternatives B and D, which addressed various development scenarios and different measures that would influence air quality emissions. Other un-modified sources or potential emission rates were not modeled. The potential impacts from these sources were addressed by adding a background concentration to any analyses of the ambient air quality impacts for comparison to National and Montana Ambient Air Quality Standards.

Montana Near-field Receptors: For Alternative A, the projected potential impacts were modeled to be below the associated ambient air quality standards for all criteria pollutants except for the cumulative analysis of potential impacts on the 24-hour PM_{10} standard. The cumulative impact on the annual PM_{10} standard was estimated to be about 86 percent of the applicable standard (50 $\mu g/m^3$) for near-field and 66 percent at far-field receptors. Potential impacts from other pollutants were evaluated to be only a few percent of the applicable ambient standard, and potential impacts from the proposed development were also well below the applicable Class II PSD increments. The potential impacts from Alternatives

B-D showed slight increases in the PM_{10} impacts, but did not change the fact that the predicted 24-hour PM_{10} impact was above the established national and state ambient air quality standards. The potential impacts of other pollutants increased slightly, but did not exceed the ambient standards. Those impacts remained at just a few percent of the established standards.

Class I and Class II Sensitive Receptor Areas: The Oil and Gas EIS evaluated air quality potential impacts from criteria pollutants in the Class I and Class II areas with national and state ambient air quality standards and PSD increments. The results for Alternative A showed cumulative potential impacts exceeding the 24-hour PM_{10} ambient air quality standard in the near-field and the PSD increments in the near-field Crow Indian Reservation Class II area and the Northern Cheyenne Indian Reservation Class I area. The cumulative potential impacts from Alternatives B-D indicated similar exceedances of the 24-hour PM_{10} ambient air quality standard in near-field and PSD increment in near-field and Northern Cheyenne Indian Reservation receptors and the Washakie WSA. However, under Alternatives B and C, cumulative potential impacts were also predicted to exceed the annual NO_2 PSD increment on Northern Cheyenne Indian Reservation receptors. The air quality analysis does not represent a regulatory PSD increment consumption analysis.

The Oil and Gas EIS also addressed potential impacts on the Class I – Air Quality Related Values (AQRVs) including visibility, acid deposition, and acid neutralizing capacity at sensitive lakes. Potential impacts on visibility were evaluated in accord with the FLAG (2000) method which tabulated the number of days in which increased visibility impairment was greater than 10 percent of the background value at each receptor group. The results for Alternative A showed almost no impact from project development sources only; however potential impacts associated with non-project sources and cumulative impacts led to modeled impacts up to 25 and 28 days per year at Class I receptors to the east (predominately downwind) of the project area (Badlands National Park and Wind Cave National Park, respectively). Although the Northern Cheyenne Indian Reservation is designated as Class I for air quality, national visibility regulations do not apply to the Northern Cheyenne Indian Reservation Class I area because such regulations only apply to mandatory Class I areas. The maximum potential impacts on visibility show up to 42 days in which potential impacts were modeled at the Northern Cheyenne Indian Reservation. Among the Class II areas evaluated, the maximum potential impacts were noted for up to 69 days or more at the Crow Indian Reservation and up to 61 days at the Fort Belknap Indian Reservation.

The results for the other full development alternatives show modeled potential impacts at mandatory Class I areas for only 0-4 more days per year when emissions from all sources are considered. Potential impacts at the Northern Cheyenne Indian Reservation are up to 92 days per year and up to 116 days per year at the Crow Indian Reservation.

Acid Deposition: The Oil and Gas EIS evaluated potential impacts at identified sensitive lakes. The acid neutralizing capacity of each of the lakes was tabulated, and the predicted deposition of nitrogen and sulfur compounds was used to evaluate changes in acid neutralizing capacity at each lake. The guideline indicates that if the acid neutralizing capacity of a lake is above 25 micro-equivalents per liter (µeq/L) then a 10 percent change in acid neutralizing capacity is considered significant (USDA 2000, Fox et al. 1989). For lakes with lower acid neutralizing capacity a change of 1 µeq/L is considered significant.

Results showed that potential impacts were below the established thresholds for all lakes except Upper Frozen Lake in the Bridger Wilderness Area for all alternatives considered. For this lake, whose acid neutralizing capacity is less than 25 µeq/L, each alternative led to an increase of more than 1 µeq/L. For other lakes only Florence Lake in the Cloud Peak Wilderness Area showed a potential impact that was above the 10 percent change. Under Alternative B, C, and E, a cumulative increase of 10.4% was indicated.

Coal Review

As noted above, the Coal Review documented the air quality impacts of operations for coal development in the same region along with technical analyses of water and socioeconomic studies for potential coal development in the Montana and Wyoming Powder River Basin area. Figure 1-2 provides a depiction of the coal review study area and the associated receptor grids. Modeling results were presented for a base year (2002), using actual emissions and estimates of actual emissions and operations for that year. Modeling results were also presented for upper and lower reasonably foreseeable development scenarios, projected for 2010; and qualitative estimates of potential impacts were provided for 2015 based on expected development of specified source groupings. The analyses evaluated potential impacts both within the PRB itself and at selected sensitive areas

surrounding the region. The analysis specifically looked at potential impacts of coal mines, power plants, coal-bed methane development, and other activities. Results were provided for both Montana and Wyoming source groups and receptors.

The study area covers the CBNG development region in Montana. The technical air quality analysis effort focused on coal development, with additional assessment of CBNG development in Wyoming.

For the base year, results were provided as maximum potential impacts for receptor groups, including the near-field grid receptors, separately in Montana and Wyoming, and at the sensitive Class I and Class II receptor groups. This analysis provided the basis for making estimates of changes in future impacts. The analysis also provided potential impacts of acid deposition and visibility in the sensitive receptor areas, as well as assessment of changes in acid neutralizing capacity at identified sensitive lakes.

In general, the air quality in the region is very good, as demonstrated by measured levels of NO_2, SO_2, and PM_{10} with the exception of PM_{10} concentrations near coal mine operations. Both the monitored data and the modeled results for the base year study showed that there was a concern about ambient concentrations of PM_{10}, particularly for the 24-hour standard in the near-field receptor grid at receptors near coal mine operations in both Wyoming and Montana. This result was consistent with the modeled concentrations, which showed potential exceedances of the 24-hour PM_{10} standard for the base year. The Class I area potential impacts were evaluated to compare potential impacts to PSD increments as a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

At the Wyoming near-field receptors, the maximum potential impacts were associated with coal-related operations in Wyoming. Potential impacts of NO_2 and SO_2 were well below the ambient air quality standards for all receptors. For PM_{10} the analysis predicted potential impacts above the 24-hour PM_{10} National and Wyoming Ambient Air Quality Standard of 150 $\mu g/m^3$ at a few receptors near the mining operations. The base year maximum annual potential impacts were predicted to be below the annual PM_{10} standard of 50 $\mu g/m^3$. The maximum potential impacts were restricted to a few receptors near the mining operations, however.

Similar to the near-field in Wyoming, the projected potential impacts on NO_2 and SO_2 levels in Montana were well below the applicable state and federal standards. The predicted impacts on 24-hour PM_{10} levels were above the standard of 150 $\mu g/m^3$ at a few points near mining operations. The annual PM_{10} impact was predicted to be below the annual standards.

Of all the Class I areas that were analyzed, the maximum potential impacts were predicted to occur at the Northern Cheyenne Indian Reservation in Montana. The bulk of the potential impacts for all three criteria pollutants at Class I areas were caused by coal-related sources in Montana, and the bulk of the SO_2 impacts occurred from power plant emissions. All potential impacts were predicted to be below the ambient standards at all receptors for the base year. Of all the Class I areas that were analyzed, the maximum potential impacts were predicted to occur at the Northern Cheyenne Indian Reservation in Montana. Potential impacts at other Class I areas were also tabulated, but showed still lower impacts. At the nearest areas (Washakie Wilderness Area and Wind Cave National Park) impacts were generally a few percent of the ambient standards.

Among the sensitive Class II areas, the maximum potential impacts occurred at the Crow Indian Reservation in Montana. Potential impacts of NO_2 and SO_2 at sensitive Class II areas were again well below the ambient standards, but PM_{10} impacts were 20 percent of the 24-hour ambient standard and 6 percent of the annual PM_{10} standard. Among the sensitive Class II areas, the maximum potential impacts occurred at the Crow Indian Reservation in Montana.

Visibility potential impacts were analyzed for the indicated Class I and Class II areas. Using the CALPUFF modeling system, potential impacts were analyzed using the Method 6 approach, which uses monthly relative humidity values for each of the receptor groups. Potential impacts were assessed using the highest 24-hour calculated extinction within each receptor group, and were calculated as a percent change in extinction from a background value. The study tabulated the reduced visibility at the maximum impact receptor in each of the Class I and Class II groups. Results were presented as the number of days of annual visibility reduction of 5 percent and 10 percent of the background value. Maximum potential impacts were observed at Class I areas adjacent to the source area (the Northern Cheyenne Indian Reservation) and to the east of the PRB, specifically the Badlands National Park and the Wind Cave National Park. These receptor groups had maximum modeled impacts above 10 percent degradation for 200 days or more per year.

Acid deposition potential impacts were analyzed for nitrogen and sulfur compounds for all the indicated Class I areas. For all areas, the combined deposition rates did not exceed the established thresholds of 3 kilograms per hectare per year (kg/ha-yr) for nitrogen compounds and 5 kg/ha-yr for sulfur compounds. The maximum deposition rates were observed at the Wind Cave National Park but all potential impacts were less than 10 percent of the established thresholds.

Eight separate lakes were identified as sensitive to acid deposition impacts, and were analyzed in accord with the screening methodology as provided by the US Forest Service. Data for lake acid neutralizing capacity were taken from the FS web site, which provides data for the 10 percent ANC values for the individual lakes. The threshold for significance was established at a change of 10 percent reduction for lakes with an acid neutralizing capacity of 25 micro-equivalents per liter (μeq/L) or more and a change of 1 μeq/L for lakes with less than 25 μeq/L acid neutralizing capacity. For the base year, all potential impacts were below the established thresholds, but were close to the established thresholds for Upper Frozen Lake in the Bridger Wilderness Area and at Florence Lake in the Cloud Peak Wilderness Area.

The Task 3A report for the Coal Review provided a modeling assessment of projected coal-related growth for 2010. Both a projected lower development scenario and an upper development scenario were analyzed. For coal-related sources, the overall projected growth in operations (and emissions) for the lower development scenario was about 13 percent in both Wyoming and Montana. For the upper development scenario, the projected growth from the base year was about 32 percent in Wyoming and 41 percent in Montana. The analyses included the foreseeable growth in power plant emissions, as a result of foreseeable additions to power generation. The Roundup Power Plant was not included directly in this analysis (although a separate evaluation of this individual source was conducted with the same modeling effort).

In comparison to the base year results discussed above, the following conclusions were made: For the near-field receptor grids, air quality modeling results showed that the predicted development continued to exacerbate the predicted air quality impacts for 24-hour PM_{10} and that the impacts on annual PM_{10} levels in Wyoming only would exceed the PM_{10} standard of 50 $\mu g/m^3$ at a few receptor points under the 2010 upper development scenario. Potential impacts of other pollutants increased with increased development, but the modeled impacts remained well below the ambient air quality standards.

The major potential impacts on Class I areas continued to occur at the Northern Cheyenne Indian Reservation. Predicted impacts were well below the ambient standards, but were above the PSD increments. At other Class I areas, only the 24-hour PM_{10} impacts were modeled to be above the PSD increments for the base year and for the 2010 upper and lower development scenarios.

At the modeled Class II receptor areas, the maximum potential impacts occurred at the Crow Indian Reservation. Predicted 24-hour PM_{10} impacts were above the PSD Class II increments (30.5 to 36.7 $\mu g/m^3$ versus a standard of 30 $\mu g/m^3$). Impacts at other Class II areas were below the established Class II increments.

At the identified Class I areas, the analysis identified the modeled increase in the number of days where potential impacts exceeded a 10 percent reduction in visibility. The major potential impacts occurred at Class I areas to the east of the PRB area, including, for the 2010 upper development scenario, an increase of 26 days per year at Badlands National Park, 22 days per year at Theodore Roosevelt National Park, and 15 days per year at Wind Cave National Park.

For sensitive lake impacts, modeled results showed changes in acid neutralizing capacity above 10 percent at Florence Lake for each of the 2010 scenarios, and an increase of more than 1 μeq/L at Upper Frozen Lake. These findings are consistent with the Oil and Gas EIS and with the base year Coal Review analysis. In general impacts at other lakes are well below the thresholds for significant impact.

Objective of This Study

The main objective of this study is to identify the changes in air quality impact resulting from the projected alternatives of development. Potential impacts are assessed at "near-field receptor grids" in both Wyoming and Montana and at the individual sensitive receptor areas as well. The impacts were evaluated for the same receptor set that was used in the Coal Review, using the same dispersion model and the receptor data. The near-field potential impacts refer to receptors in the Powder River Basin, near the projected development. Generally those receptors are within 50km of the development area.

The assessment included evaluation of potential impacts at all receptor groups on ambient air levels of nitrogen dioxide (NO_2), sulfur dioxide (SO_2),

particulate matter with aerodynamic diameter of 10 microns or less (PM_{10}), and selected hazardous air pollutants (HAPs). The HAPs were evaluated at the near-field receptors in Montana and Wyoming, but not at the sensitive receptor areas. At the sensitive receptor areas, potential impacts on visibility and acid deposition were also evaluated. The study evaluates the changes in potential impacts for each of these fields for the expected levels of development. The study includes evaluation of potential impacts at identified sensitive lakes in the region.

The study included development of emission rates and emission factors, or increases in emissions, for each of the source groups. Emission rates for CBNG development and conventional oil and gas development were based on data developed for the 2003 final EIS (Argonne 2002). Information from state agencies was utilized for development of the baseline year emissions from non-project sources.

Key Issues

Similar to the Coal Review, the key issues include the following:

- Characterizing emissions and controls. The emission source groups that were developed for the Coal Review form the basis for developing emission rates for this study, based on the changes in expected production for those source groups.
- Using representative meteorological data. Modeling was conducted using three years of gridded meteorological data, using the CALPUFF modeling system. The potential impacts of base year operations were modeled with all three years, and the year with the maximum impact was chosen for further modeling addressing the alternate development scenarios.
- Assessing nearby impacts. The evaluation of potential impacts in the PRB, using a "near-field receptor grid" is similar to the Coal Review Task 1A study. The study does not address the type of impact analyses that would be provided for obtaining an air permit for a specific facility. The focus is to provide a general depiction of overall potential impacts in the region.
- Assessing potential impacts on Class I and sensitive Class II areas. Class I sensitive areas require enhanced protection, based on federal law. The study evaluates potential impacts on ambient air quality standards, acid deposition, visibility, and identified sensitive lakes. The PSD increment consuming sources are not identified or modeled separately in this study. Therefore while the results are compared to the Class I and Class II PSD increments, no formal PSD evaluation is made.

Figure 1-1

Montana Statewide Oil and Gas EIS Study Receptor Grids and Modeling Domain

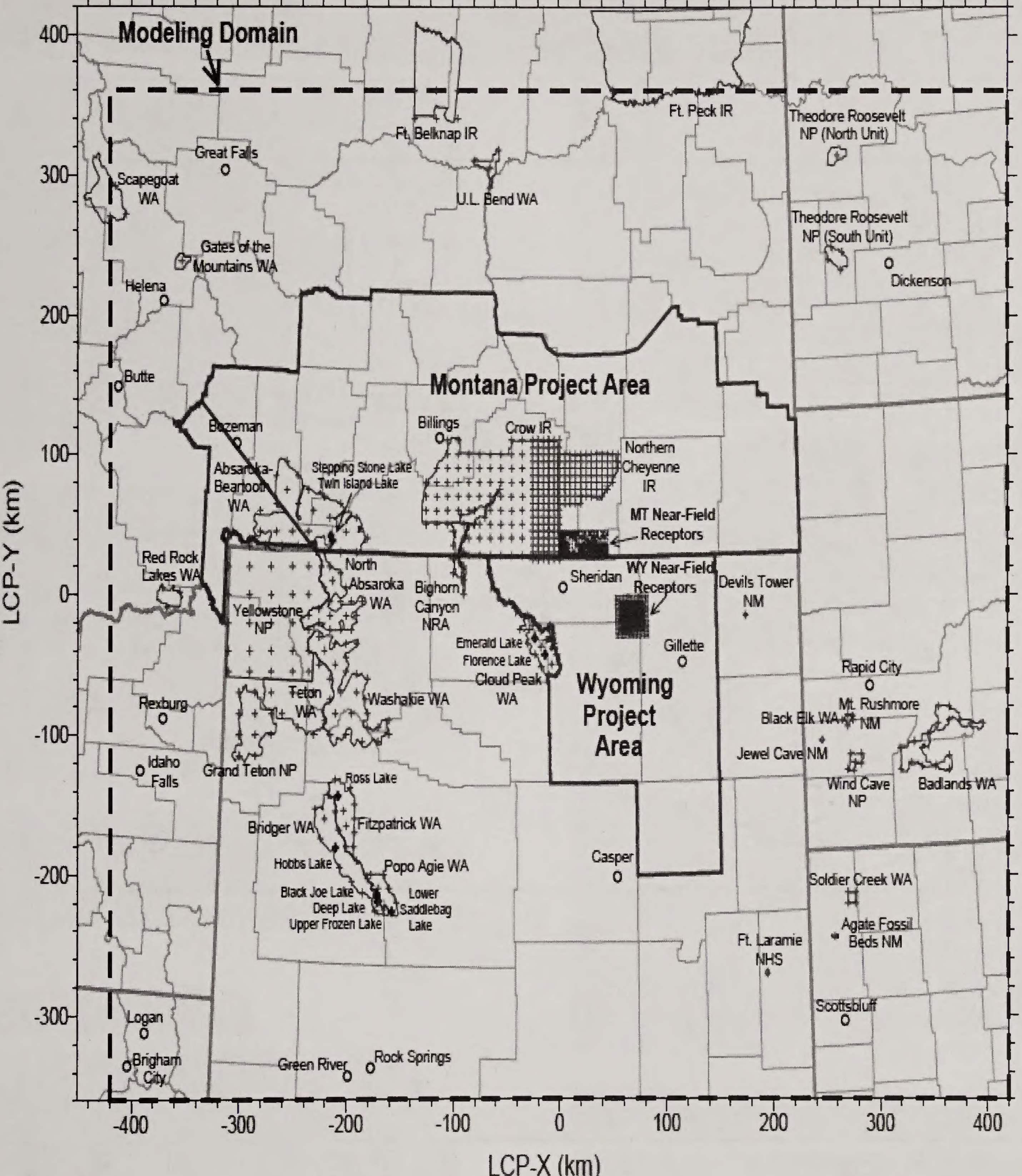
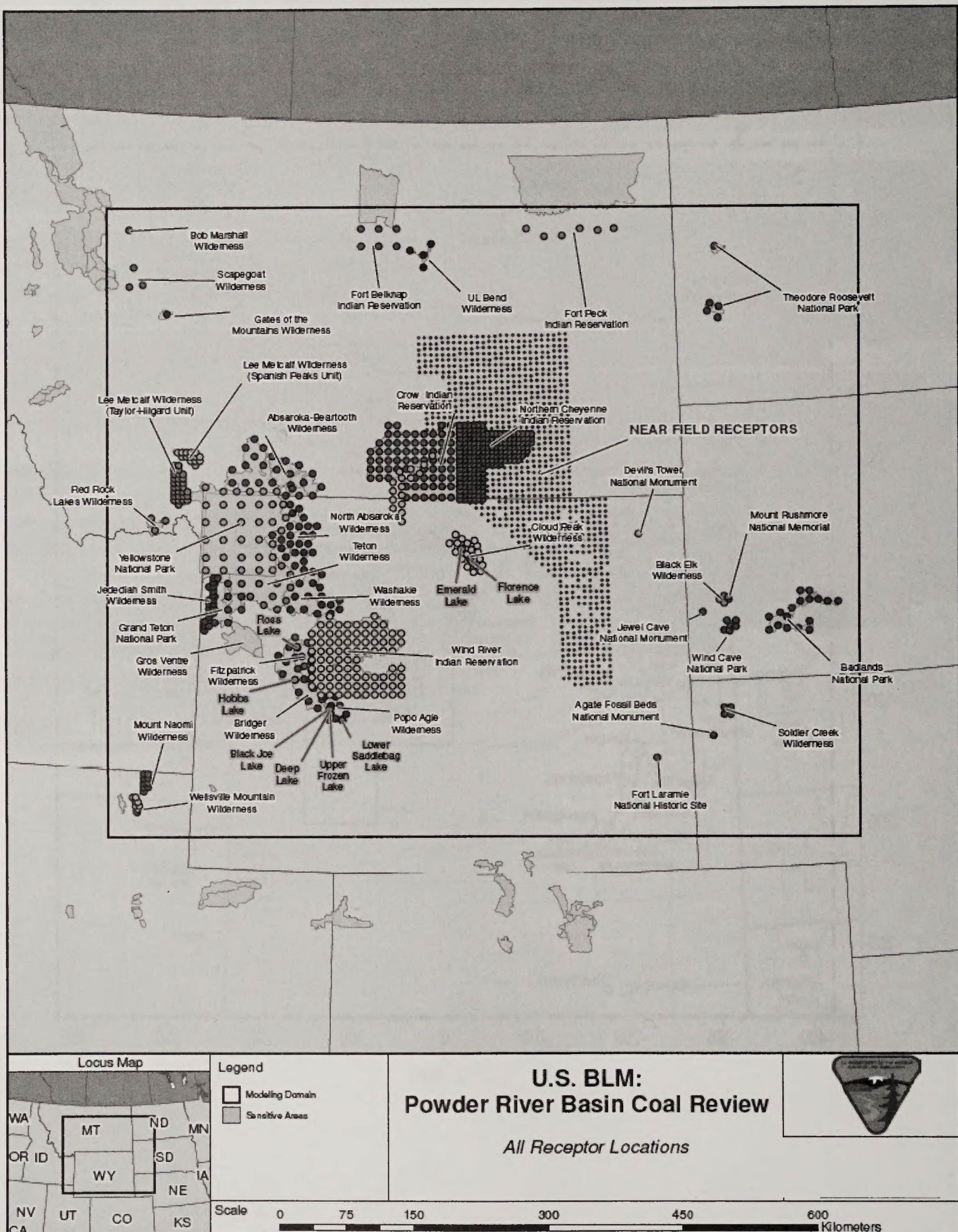


Figure 1-2

Coal Review Receptor Grids and Modeling Domain



2.0 TECHNICAL APPROACH

Overview of Assessment Approach

The objective of the study is to evaluate potential impacts over a wide range of receptors centered over the PRB study area. The evaluation covers receptors within the PRB in both Montana and Wyoming, and it includes individual sensitive receptor groups in the region surrounding the PRB study area. Key aspects of the assessment include the selection of air emissions within the study area, the selection of a modeling system to conduct that evaluation, the selection of a receptor set (within the model system) to be used for evaluating those potential impacts, and the selection of criteria for evaluation of those potential impacts.

This study addressed the impact of changes in emissions from a base year for three separate development scenarios. The assessment evaluated changes in air quality levels for NO_2, SO_2, PM_{10} and $PM_{2.5}$ at the identified receptors. The potential impacts from the development scenarios were assessed at all receptor groups. The study analyzed the potential impacts from identified separate source groups, which allowed a characterization of potential impacts from the individual groups.

This section provides a detailed review of the modeling system, the emissions characterization, the receptor grids that were used, and the assessment criteria that were used for evaluation of potential impacts.

Air Quality Modeling

To conduct a formal modeling of those potential impacts, the USEPA guideline model CALPUFF (Scire, et al. 2000) was used to estimate potential impacts in both the PRB receptors and the sensitive surrounding areas. The CALPUFF modeling system was recommended for a refined modeling analysis of the region in order to assess potential impacts over near-field and distant receptor areas. The CALPUFF modeling system has three main components:

- CALMET (a diagnostic three-dimensional meteorological model, which develops the meteorological data for modeling input);
- CALPUFF (the transport and dispersion model that carries out calculations of dispersion);
- CALPOST (a post processing package that is used to depict overall concentrations and potential impacts).

The CALPUFF modeling system is designed to treat the time-varying point and area source emissions, model domains at distances from tens of meters to hundreds of kilometers from the sources; predict averaging times from 1 hour to 1 year; predict impacts for inert pollutants that are not chemically changed in the atmosphere; predict potential impacts of pollutants that may be subject to removal and chemical conversion mechanisms; and be applied to rough terrain situations. Given these strengths and the objectives of the study, the CALPUFF model is aptly suited to carrying out the required atmospheric dispersion modeling.

The CALPUFF modeling domain for the PRB Coal Study was established to be identical to that used in the PRB Oil and Gas Final EIS (BLM 2003d) and the base year study that is part of the overall coal review (ENSR 2005a,b). A depiction of the CALPUFF modeling domain, along with the depiction of the study area and sensitive receptors, is provided in Figure 1-2.

The CALMET input files were developed from the regional MM5 data base for 2001, 2002, and 2003. All three years were used to develop the potential impacts for the base year (2004 emissions). The study first analyzed the potential impacts for all three years for the base year, focusing on potential impacts in the near-field. A comparison of the potential impacts from those three years concluded that the year 2002 would provide the highest potential impacts in the near-field. For each of the development scenarios, the potential impacts were then analyzed using only 2002 meteorological data.

Receptor Grids and Analyses

Receptor grids were established for both near-field and far-field areas (sensitive Class I and Class II areas of concern). These included the near-field receptors in both states, which cover the study area in each state. The receptor grids are the same as those in the Coal Review, as shown in Figure 1-2. The near-field grid receptors cover grid points within the boundaries of the PRB development area. Near-field receptors were arranged to obtain the maximum estimated concentrations that result from development within the PRB.

The purpose of establishing the near-field receptors is to characterize the overall air quality conditions in the PRB as a result of this development, but not to focus on potential impacts from any one individual source. This approach does NOT address the modeling that would be needed for assessing potential impacts at any facility fence lines, which is generally required for obtaining an air permit from a regulatory agency. Consequently, all near-field receptors that were located within 1 km of a modeled source were removed from the near-field grid. Overall the near-field receptor grid points were spaced at 1-km intervals over the study area. The elevation of each receptor was obtained from the USGS Digital Elevation Model data for the 1:250,000 quads with 90-meter horizontal resolution.

Receptors spaced at 1-km intervals were located along boundaries of Class I and Class II areas and receptors spaced at 2-km intervals were located within each of the following Class I and specified Class II sensitive areas of concern within the modeling domain:

- Badlands National Park
- Wind Cave National Park
- Bridger Wilderness Area
- Fitzpatrick Wilderness Area
- Washakie Wilderness Area
- North Absaroka Wilderness Area
- Northern Cheyenne Indian Reservation (Class 1, Northern Cheyenne Tribal Council)
- Devils Tower National Monument
- Mount Rushmore National Memorial
- Jewel Cave National Monument
- Agate Fossil Beds National Monument
- Fort Laramie National Historic Site
- Black Elk Wilderness Area
- Soldier Creek Wilderness Area
- Cloud Peak Wilderness Area
- Yellowstone National Park
- Grand Teton National Park
- Teton Wilderness Area
- Absaroka Beartooth Wilderness Area
- Bighorn Canyon National Recreation Area
- Popo Agie Wilderness Area
- Crow Indian Reservation (Class II, Crow Tribal Council)
- Theodore Roosevelt National Park

The following areas are near the edge of the modeling domain. Modeled impacts at receptors within these areas near the edge of the modeling domain might be associated with model inaccuracies and uncertainties due to edge effects of the modeling. Therefore, estimates of potential impacts to these areas near the edge of the modeling domain were made by placing representative receptors no nearer than 25 km from the edge of the modeling domain:

- Bob Marshall Wilderness Area
- Gates of the Mountains Wilderness Area
- Lee Metcalf Wilderness Area, Spanish Peaks Unit
- Lee Metcalf Wilderness Area, Taylor Hillgard Unit
- Red Rock Lakes Wilderness Area
- Jedediah Smith Wilderness Area
- Mount Naomi Wilderness Area
- Wellsville Mountain Wilderness Area
- U.L. Bend Wilderness Area
- Fort Peck Indian Reservation (Class I, Fort Peck Tribal Council)
- Scapegoat Wilderness Area
- Fort Belknap Indian Reservation.

These locations as well as other sensitive receptors, such as lakes are indicated in Figure 1-2. The receptors were spaced with sufficient density to assure that the maximum potential air quality impacts are evaluated. All sensitive receptors were identified and reviewed in the modeling protocol by the stakeholder group, prior to initiating the modeling.

Emissions Input Data

Source characterization and emissions data are key inputs to conducting a successful modeling analysis. The bulk of the emissions data were provided by the regulatory agencies (Wyoming Department of Environmental Quality, or WDEQ, and the Montana Department of Environmental Quality, or MDEQ). Emissions data for major sources in nearby states, which are also within the model grid, were obtained from the individual state regulatory agencies (Idaho, Utah, Nebraska, South Dakota, and North Dakota).

Emissions Source Groups

Similar to the Coal Review, the emission sources for the study were separated into various emission source groups, which were analyzed separately. The emission source groups that were analyzed focused on certain air pollutant emissions including SO_2, NOx, and PM_{10}. The emission source groups that were analyzed also focused on certain hazardous air pollutant (HAP) emissions including benzene, n-hexane, toluene, ethyl-benzene, xylene and formaldehyde. The study also included a group of major sources that were identified by the Environmental Defense Fund (and others) in response to the analyses in the Montana Statewide EIS. The following emission source groups were analyzed as part of this study:

- All sources combined;
- CBNG sources;
    - CBNG production, separately for each state
    - CBNG operation, separately for each state;
- Conventional oil and gas sources;
- Coal-related sources (from both states, including power plants and conversion facilities) ;
- Coal mines (in both states) ;
- Montana sources (all sources located in Montana not otherwise identified);
- Wyoming sources (all sources located in Wyoming not otherwise identified);
- Non-coal sources (roads, railroads, urban areas, miscellaneous sources, all sources in ID, UT, NE, SD, ND) ;
- Environmental Defense Fund (EDF) identified sources; and
- Power plants (includes coal- and gas-fired power plants in Wyoming and Montana).

Base Year Selection

At the start of the project the year 2004 was selected as a base year for determining current emissions and potential impacts. The 2004 data were readily available, and the year coincided with the emissions inventory being collected by the Western Regional Air Partnership (WRAP). Emission rates for 2004 were calculated in different manners for each emission source group. Emission rates for the projected development scenarios were estimated for the year with the expected maximum emissions from the development scenarios. For this effort, the 20th year of projected development was used, as discussed below. The methodology used to calculate emission rates for each emission source group is as follows.

Alternative Development Year

The purpose of this effort is to characterize maximum emissions from selected alternate development scenarios over an extended period in the future, and to evaluate the comparative potential impacts from the emissions associated with each alternate development scenario when considering approval of any of those alternatives. This study will use projected emissions for each scenario as input into the dispersion model. The alternative development year (ADY) that was used for evaluation of alternatives was selected based on the total maximum emissions from the Montana CBM construction and operation combined for each of the alternatives over a 20 year span.

Data shown in Table 2-1 provide the total emissions from well construction and operations, and total emissions from the combined sources for each alternative. The table shows the maximum potential impacts are likely to occur in year 20 or 21 of this analysis (2026 or 2027) for all alternatives. Construction emissions peak in Year 4, but operational emissions are much larger and therefore dominate the emission pattern. Details of the total emissions are provided in the Air Quality Modeling Technical Support Document (ALL 2006). Based on the emissions data presented in Table 2-1, Year 20 was selected as the ADY for which potential impacts are modeled in this report. For the base year (2004) and the ADY (Year 20), a set of emission factors and emission rates for each of the identified source groups was developed, as described below.

Emissions by Source Group

This section summarizes the calculation of emissions for each source group identified above. Both the base year and ADY are included in this discussion.

Coal Bed Natural Gas Sources

As shown in Table 2-1, the coal bed natural gas (CBNG) production sources form the basis for conducting the evaluation. For this study, projected CBNG development was provided for the Montana area study by watershed area. Each of the watersheds was identified and a level of CBNG development was assigned to each watershed, including both well development/construction and well operation in year 20. Emissions from the well development and operation were calculated based on the number of

wells in each category, using emission factors that were developed for Table 2-1.
A total of 15 separate watersheds are included in this analysis, for each of the three alternative development scenarios that are under consideration. Table 2-2 lists each alternative, along with projected development and associated emission rates for each watershed. The total wells and emissions are also provided for each alternative.

Among the alternatives, there are different development rates in several of the watersheds. In the Rosebud watershed, the maximum operation wells occur in Alternative E, with less in Alternatives F and H respectively. The Lower Yellowstone Sunday and Upper Yellowstone Lake B combined had greater development in Alternative E than in any of the other alternatives.

Overall Alternative E had greater development in terms of operational wells, but the least in terms of wells under construction. In general the development from Alternative E through Alternative H showed an increase in the number of wells under construction. Other relevant development data is presented in Tables 2-1 and 2-2.

To conduct the modeling, the emissions from each watershed were assigned to 5 separate point sources within each watershed, using representative stack parameters for oil and gas development.

Table 2-1
Total Annual Emissions for Alternatives Under Consideration

	Alternative E			Alternative F			Alternative H		
Year	Sum Total Emissions Oper (Tons)	Sum Total Emissions Const (Tons)	Sum Total Emissions All (Tons)	Sum Total Emissions Oper (Tons)	Sum Total Emissions Const (Tons)	Sum Total Emissions All (Tons)	Sum Total Emissions Oper (Tons)	Sum Total Emissions Const (Tons)	Sum Total Emissions All (Tons)
1	536	1917	2454	357	1277	1634	357	1276	1633
2	1717	2303	4021	1250	1915	3166	1250	1914	3164
3	3543	4220	7762	2419	2261	4679	2419	2263	4681
4	6009	4596	10605	3740	2461	6201	3744	2473	6217
5	8476	4220	12696	5080	2260	7340	5069	2263	7332
6	10516	3070	13586	6255	1914	8169	6261	1999	8260
7	12126	2684	14810	7333	1916	9249	7356	1914	9271
8	13413	1917	15331	8412	1914	10326	8428	1914	10342
9	14486	1918	16404	9490	1914	11404	9499	1914	11413
10	15452	1532	16984	10568	1914	12482	10570	1914	12485
11	16202	1151	17353	11644	1915	13559	11642	1914	13556
12	16846	1151	17998	12713	1905	14618	12713	1914	14627
13	17490	1150	18641	13731	1734	15465	13784	1914	15699
14	18134	1150	19285	14702	1735	16437	14856	1914	16770
15	18778	1151	19929	15673	1735	17407	15927	1914	17842
16	19368	959	20327	16573	1482	18055	16998	1914	18913
17	19905	957	20862	17401	1479	18880	18040	1809	19850
18	20441	960	21400	18200	1377	19578	19018	1683	20701
19	20924	766	21690	18906	1143	20049	19930	1578	21508
20	21457	571	22028	19487	935	20422	20754	1367	22122
21	0	0	0	19691	1070	20761	21071	575	21646
22	0	0	0	19032	1043	20075	0	0	0
23	0	0	0	17198	1049	18247	0	0	0

Coal Production Related Sources

For coal production related sources, which included mines, mine roads, railroads, and coal conversion sources, the base year data (2004) was used to establish the baseline emissions. Coal production estimates were obtained from analyses of the Coal Review, and those estimates were used to change total coal-related mining sources Total coal development was based on the Coal Review. Emissions for the ADY were based on coal development projections and applied to both Montana and Wyoming.

Figure 2-1 provides a graphical representation of the expected changes in coal production over the next two decades. The Coal Review provided an updated coal production scenario for 2004 and 2020. The coal average values of the coal production increase from 380 million tons/year in 2004 to 580 million tons/year in 2020. This ratio (1.53) was applied to coal development in Wyoming and Montana from the base year to the ADY.

Conventional Oil & Gas Sources

For conventional oil and gas sources, the baseline year data (2004) was used to establish the baseline emissions. The number of operating wells and the number of conventional oil and gas production levels for the base year and for the ADY were obtained from available data (MBOGC 2006). Emissions estimates include both operating wells and well construction as indicated in the Table 2-3. The emission factors shown in Table 2-3 were developed from a combination of data sources, and the factors represent the emissions in ton/year that would be emitted by either well construction or well operation. For the ADY, the total number of wells, including operation and construction are also indicated. The table shows the dramatic increase in the number of operating wells, but a slight reduction in the number of wells being constructed. Overall, emissions of NO_X from this source group would decline about 109 ton/year from the base year to the ADY. Emissions of PM_{10} would increase slightly and emissions of SO_2 would decrease slightly from the base year.

To conduct the modeling effort, the locations of the emissions sources were assigned to five separate point sources within each of the indicated counties. No specific site location data were available, and therefore this approach represented a suitable approximation for the modeling effort.

Power Plant Sources

For coal-fired power plants, the projected ADY emission rates for power plants that were not operational in 2004 but are expected to be operational in the ADY were derived from the actual power plant permit applications or the power plant permits from the specified facility. This should allow for a conservative estimate since the permitted emission rates will be the allowable emission rates, and actual emission rates from these new power plants could be less than the allowable emissions but cannot be higher. Where stack parameters were available, those data were used for input into the modeling. Emissions of NO_x, SO_2, and PM_{10} from the power plant permits were determined from expected levels of best available control technology (BACT) that would be applied to those sources. If a coal-fired plant permit application or permit was not obtainable, emissions from a coal-fired plant of the equivalent size was used to estimate emissions. The coal-fired power plants for which emissions were estimated for the ADY include the following:

- WYGEN2
- Two Elk Unit 1
- Basin Electric / Gillette
- Hardin Generating Station
- Roundup Power Plant
- Great Falls Power Plant

These coal-fired power plants are included as individual sources, in addition to the existing coal-fired facilities which were also analyzed. For existing coal-fired power plant sources that were operational in 2004, to account for a possible increase in capacity between the baseline year to ADY, a scaling factor was used to increase the capacity of these sources from 88% capacity factor in 2004 to a 90% capacity factor in the ADY.

Table 2-2
Summary of Total Emissions by Watershed
Year 20 of Development

Alternative E

Watersheds	Operational Wells	Construction Wells	NOx Emissions (Tons)	PM10 Emissions (Tons)	SO2 Emissions (Tons)	VOC Emissions (Tons)
Upper Tongue	5024	0	1930	424	37	2141
Lower Tongue	4503	0	1730	380	33	1919
Middle Powder	2741	0	1053	231	20	1168
Little Powder	261	0	100	22	2	111
Rosebud	4698	0	1805	396	35	2003
Mizpah	163	0	63	14	1	70
Clarks Fork Yellowstone	587	0	226	50	4	250
Lower Yellowstone Sunday	2219	0	852	187	16	946
Upper Yellowstone Lake B	1045	93	490	121	14	453
Little Bighorn	881	100	433	110	13	384
Lower Bighorn	1043	121	516	131	15	455
Middle Musselshell	131	9	59	14	2	57
Upper Yellowstone Pompeys	262	35	133	34	4	114
Stillwater	131	23	72	19	2	57
Upper Musselshell	98	13	50	13	2	43
TOTAL	23787	394	9511	2145	201	10170

Alternative F

Watersheds	Operational Wells	Construction Wells	NOx Emissions (Tons)	PM10 Emissions (Tons)	SO2 Emissions (Tons)	VOC Emissions (Tons)
Upper Tongue	5024	0	1930	424	37	2141
Lower Tongue	4440	139	1838	424	42	1904
Middle Powder	2638	122	1129	266	27	1134
Little Powder	261	0	100	22	2	111
Rosebud	4515	198	1923	451	46	1941
Mizpah	164	0	63	14	1	70
Clarks Fork Yellowstone	653	0	251	55	5	278
Lower Yellowstone Sunday	1565	49	648	149	15	671
Upper Yellowstone Lake B	687	57	318	78	9	298
Little Bighorn	582	20	242	56	6	250
Lower Bighorn	663	35	288	68	7	286
Middle Musselshell	89	3	37	9	1	38
Upper Yellowstone Pompeys	173	12	77	19	2	75
Stillwater	85	6	38	9	1	37
Upper Musselshell	63	4	28	7	1	27
TOTAL	21602	645	8911	2050	201	9260

Table 2-2 (Continued)

Alternative H						
Watersheds	**Operational Wells**	**Construction Wells**	**NOx Emissions (Tons)**	**PM10 Emissions (Tons)**	**SO2 Emissions (Tons)**	**VOC Emissions (Tons)**
Upper Tongue	5024	0	1930	424	37	2142
Lower Tongue	4502	0	1730	380	33	1919
Middle Powder	2741	0	1053	231	20	1168
Little Powder	261	0	100	22	2	111
Rosebud	4263	322	1944	474	52	1843
Mizpah	164	0	63	14	1	70
Clarks Fork Yellowstone	587	0	226	50	4	250
Lower Yellowstone Sunday	2219	0	852	187	16	946
Upper Yellowstone Lake B	841	303	611	179	26	383
Little Bighorn	882	0	339	74	7	376
Lower Bighorn	1044	0	401	88	8	445
Middle Musselshell	86	100	128	43	7	45
Upper Yellowstone Pompeys	163	218	270	91	15	87
Stillwater	131	0	50	11	1	56
Upper Musselshell	99	0	38	8	1	42
TOTAL	23007	943	9734	2275	231	9882

Figure 2-1
Projected Coal Development for PRB Wyoming

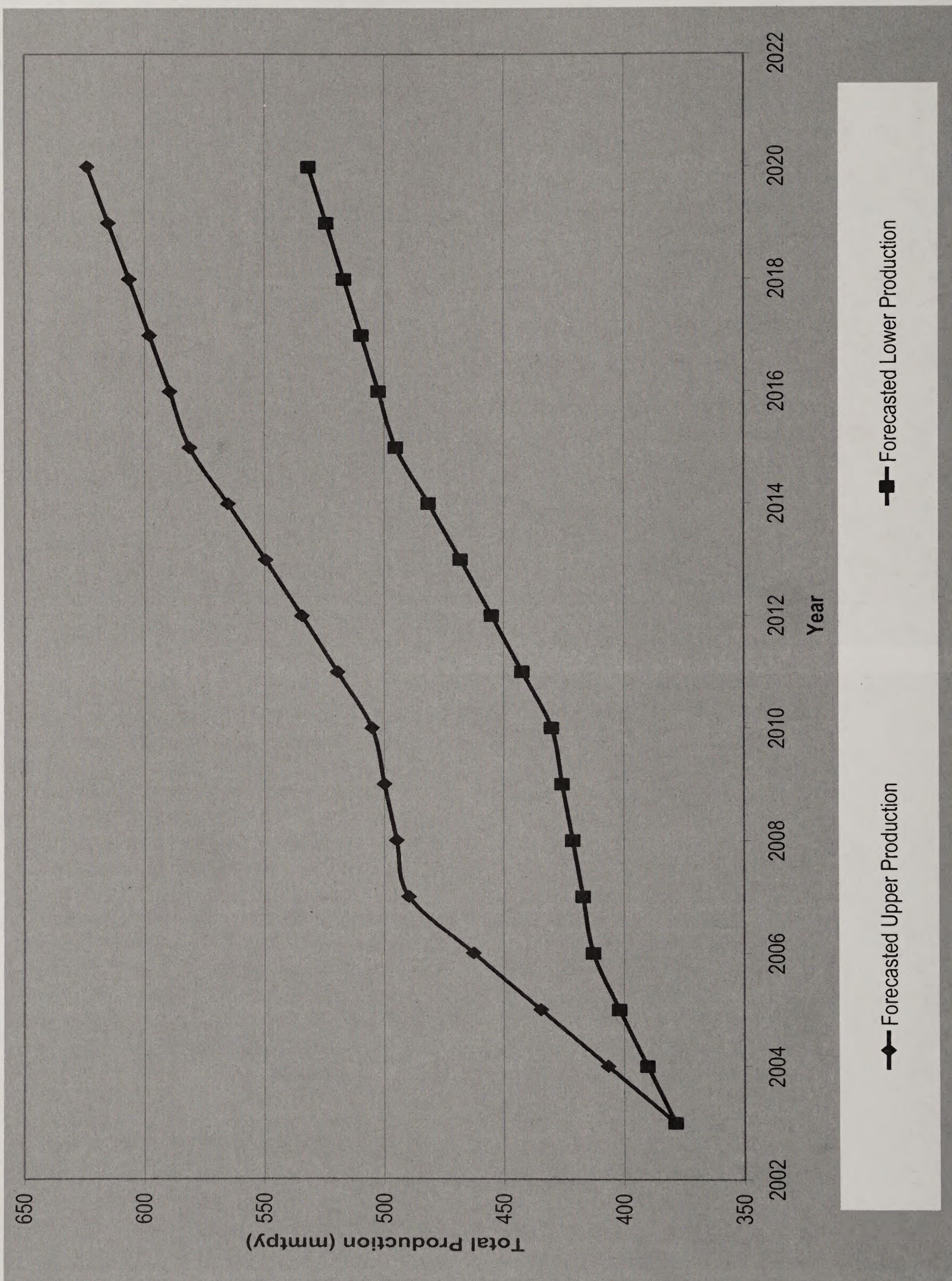


Table 2-3
Base Year 2004 and Alternative Production Year (Year 20) Emissions
Montana Conventional Oil and Gas Operation and Construction

Base Year	County	Wells Oper	Wells Const	NOx Emissions Oper (Tons)	NOx Emissions Const (Tons)	PM10 Emissions Oper (Tons)	PM10 Emissions Const (Tons)	SO2 Emissions Oper (Tons)	SO2 Emissions Const (Tons)
2004	Big Horn	46	2	1.22	18.99	0.99	1.67	0.09	2.34
2004	Carbon	99	7	2.62	66.47	2.14	5.85	0.19	8.20
2004	Custer	4	0	0.11	0.00	0.09	0.00	0.01	0.00
2004	Golden Valley	2	0	0.05	0.00	0.04	0.00	0.00	0.00
2004	Musselshell	74	20	1.96	189.90	1.60	16.70	0.14	23.42
2004	Powder River	57	5	1.51	47.48	1.23	4.18	0.11	5.86
2004	Rosebud	96	10	2.54	94.95	2.07	8.35	0.19	11.71
2004	Stillwater	16	9	0.42	85.46	0.35	7.52	0.03	10.54
2004	Sweetgrass	5	3	0.13	28.49	0.11	2.51	0.01	3.51
2004	Yellowstone	28	5	0.74	47.48	0.60	4.18	0.05	5.86
2004	Carter	0	12	0.00	113.94	0.00	10.02	0.00	14.05
2004	Wheatland	0	0	0.00	0.00	0.00	0.00	0.00	0.00
2004	Treasure	0	0	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL	427	73	11.30	693.15	9.21	60.96	0.82	85.49
	Emission Factors			0.0264573	9.4951754	0.0215694	0.8350877	0.0019282	1.1710526
ADY[1]									
20	Big Horn	230	6	6.08	60.64	4.96	5.33	0.44	7.48
20	Carbon	230	6	6.08	60.64	4.96	5.33	0.44	7.48
20	Carter	115	3	3.04	30.32	2.48	2.67	0.22	3.74
20	Custer	69	2	1.82	18.19	1.49	1.60	0.13	2.24
20	Golden Valley	34	1	0.91	9.10	0.74	0.80	0.07	1.12
20	Musselshell	402	11	10.65	106.12	8.68	9.33	0.78	13.09
20	Powder River	345	10	9.12	90.96	7.44	8.00	0.67	11.22
20	Rosebud	345	10	9.12	90.96	7.44	8.00	0.67	11.22
20	Stillwater	115	3	3.04	30.32	2.48	2.67	0.22	3.74
20	Sweetgrass	23	1	0.61	6.06	0.50	0.53	0.04	0.75
20	Treasure	11	0	0.30	3.03	0.25	0.27	0.02	0.37
20	Wheatland	17	0	0.46	4.55	0.37	0.40	0.03	0.56
20	Yellowstone	115	3	3.04	30.32	2.48	2.67	0.22	3.74
	TOTAL	2052	57	54.29	541.23	44.26	47.60	3.96	66.75
	NET CHANGE	1625	-16	42.99	-151.92	35.05	-13.36	3.13	-18.74

1 – ADY – Alternative Development Year

Other Major Sources

This analysis included emissions from other major sources in both Montana and Wyoming as wells as nearby states, which are located within the modeling domain as presented above. Each regulatory agency in Idaho, Utah, Nebraska, South Dakota, and North Dakota were contacted to obtain emissions data for sources with major operating permits (as required under Title V of the Clean Air Act Amendments of 1990). Locations and stack parameters were taken from available source data. Emissions data for 2004 were used for most cases, but for some instances, the potential emissions were used. In addition for some sources with multiple emission sources, the total source emissions were characterized as a single point for the whole facility. These sources were all over 400 km from the near-field grids in Montana and Wyoming, and such characterizations would not affect the potential impacts at these distant receptors.

The other sources included all the sources in the domain that were identified by the Environmental Defense Fund in its comments on the Montana Statewide Oil and Gas EIS.

As a convenience in interpreting the modeling, source potential impacts were grouped in several components, including all Montana sources, all Wyoming sources, railroad data, etc. In addition the Tongue River Railroad projected emissions were included. Emissions were developed for points along the segments of the railroad, with emission rates per mile developed from the Tongue River Railroad EIS.

For these other sources there was no adjustment to the emission rates from the baseline year to the alternative development year (ADY). The modeled location for the projections did not change from the baseline modeling for any sources except for the CBM development, conventional oil and gas development and new power plants.

Ambient Air Quality During the Base Year

Ambient air quality conditions in Montana for 2004 were generally very good. Reported data as provided on the USEPA AIRS data base (www.epa.gov/air/data/reports.html) for 2004 were downloaded and are summarized for each pollutant below.

PM_{10}

A total of 40 separate PM_{10} monitors were installed and operated in Montana in 2004. The applicable standards are 150 $\mu g/m^3$ for the second-highest 24-hour level and 50 $\mu g/m^3$ for the annual average.

In Big Horn County 8 separate monitors operated, with the highest second-highest 24-hour PM_{10} level of 82 $\mu g/m^3$ at Decker Coal #1 and the highest annual level of 25 $\mu g/m^3$ at Decker Coal #7. For background concentrations, the 4th highest 24-hour level was 28 $\mu g/m^3$ at Decker Coal #5 and the lowest annual average was 14 $\mu g/m^3$ at two sites.

In Rosebud County, one station operated at Lame Deer (intersection of Highways 212 and 39). The second highest 24-hour PM_{10} level was 48 $\mu g/m^3$, with an annual average of 22 $\mu g/m^3$.

In Yellowstone County (Billings) there were two operating PM_{10} monitoring sites. At these two sites, second highest 24-hour monitored level was 38 $\mu g/m^3$ and the annual averages were 16 and 21 $\mu g/m^3$ respectively.

$PM_{2.5}$

A total of 21 separate $PM_{2.5}$ monitoring sites were installed and operating in 2004, with two at Lame Deer and one in Billings (in the study area). The 24-hour standard is met by evaluating the 98th percentile of the highest concentrations for all the collected 24-hour samples. At Lame Deer Site 1, there were 114 observations and the 98th percentile value would be the 111th (fourth highest) reading. The fourth-highest 24-hour $PM_{2.5}$ level at that site was 16 $\mu g/m^3$ compared to a standard of 65 $\mu g/m^3$ (proposed to be 35 $\mu g/m^3$). At the second Lame Deer Site, there were 25 readings taken, and the second highest reading (98th percentile) was 11 $\mu g/m^3$. In Billings there were 116 observations, and the fourth-highest 24-hour reading was 19 $\mu g/m^3$. The annual average $PM_{2.5}$ levels were 5.8 and 5.9 $\mu g/m^3$ at the two Lame Deer sites, and 8.2 $\mu g/m^3$ in Billings, versus an annual arithmetic average standard of 15 $\mu g/m^3$.

NO_2

NO_2 was measured at three sites in Montana in 2004, with all three sites in Rosebud County. The Montana 1-hour standards (not to be exceeded more than once per year) is 0.5 ppm, and the actual readings were 0.027, 0.027, and 0.029 ppm at the three sites. The Montana and federal ambient standard is 0.053 ppm and the measurements for annual average at all three

Rosebud County sites was 0.003 ppm. Ambient levels are well below the applicable standards. The annual average reading is about 6 percent of the annual standard.

SO_2

A total of 13 SO_2 monitoring stations operated in Montana in 2004. Three were in Rosebud County and nine were in Yellowstone County. The Yellowstone observations are not discussed here, because they reflect impacts of nearby major SO_2 sources (although all readings are below applicable ambient standards). In Rosebud County, the highest second-highest 1-hour SO_2 readings are 0.007, 0.013, and 0.016 ppm respectively, against a Montana-only 1-hour standard of 0.5 ppm. The highest second-highest 3-hour values are 0.003, 0.006 and 0.007 ppm respectively compared to a standard of 0.5 ppm. The highest second-highest 24-hour averages are 0.002, 0.003, and 0.004 ppm respectively, compared to an ambient standard of 0.14 ppm. For the annual average, all Rosebud measurements are 0.001 ppm, compared to an annual average standard of 0.03 ppm. Results show that for the Rosebud County area, the actual levels are about 3 percent of the standards or less. Current SO_2 conditions in the study area are very clean.

3.0 MODELED RESULTS FOR BASE YEAR AND ALTERNATIVE DEVELOPMENT SCENARIOS

Using the model and source groups discussed in Chapter 2, the modeling effort evaluated the three meteorological years (2001, 2002, and 2003) by modeling potential impacts of each of the source groups for the base year (2004). Potential impacts from the base year study showed that maximum potential impacts occurred with the 2002 meteorological data. Further analyses for the three development alternatives then used the 2002 meteorological data only for assessing potential impacts.

A summary of the key findings for each of the air quality components is provided in Table 3-1. The detailed analysis for each of the components is provided in this Chapter. In general the results of this modeling study are consistent with the findings of the Coal Review and the Oil and Gas EIS.

Impacts on Ambient Air Quality

Using the receptor grids identified in Chapter 2 along with the source groupings, the model was used to predict the potential impacts at each receptor point in the receptor grid. For this analysis, the results are provided for the maximum receptor in each group, which may not be the same receptor in each of the modeling scenarios. Potential impacts may occur at different receptors for each of the modeling scenarios, but those changes in maximum receptor are not identified in these results.

The analysis does not separate the sources into PSD increment-consuming and non PSD increment consuming sources. Therefore the results cannot be used to develop a pattern of increment consumption for a particular site. The PSD comparisons are for disclosure of potential impacts and identification of potential areas of concern only and do not constitute a regulatory PSD increment consumption analysis, which may be required for specific projects by air permitting authorities.

The model results are also limited by certain assumptions regarding sources and receptors. The source characterizations are based on available data, and do not represent specific stacks or sources of fugitive emissions. The modeling sources are generally provided by area or volume, to represent multiple sources within each specified unit. The specific fence lines or exclusion areas around a modeled source are also not specifically identified in this study. The results cannot, therefore, be interpreted as evaluating maximum potential impacts that might occur at the boundary or fence line of a specific source. The receptors in the near-field grid in both states were removed from modeling if their location was within 1 km of any source.

Table 3-1
Summary of Modeled Air Quality Impacts

Air Quality Component		Alternate Development Year Impacts (includes modeled base year emissions)
Concentrations	Criteria	Below NAAQS and state AAQS, except near-field PM10
	HAPs	Less than RELs and RfCs, except for benzene
Visibility	Far-field	Class I areas have greater than 200 days with greater than 1 dv, maximum impacts not affected by scenarios E, F and H.
Atmospheric Deposition Sulfur	LOC	Below 5 kg/hectare-year
Atmospheric Deposition Nitrogen	LOC	Below 3 kg/hectare-year
Atmospheric Deposition Lake Chemistry	ANC	Development raises impacts above LAC for two lakes.

Impacts at Near-field Receptors in Montana

Results are provided for the near-field receptor grid for Montana in Figure 3-1. The figure shows the potential impacts at the maximum receptor for each modeling scenario: the base year, and the maximum potential impact for each of the alternative scenarios. The potential impacts on that receptor group are depicted for all sources and the potential impacts that result from the individual source groups are identified in Figure 3-1. Data are provided for each ambient standard and PSD increment for NOx, SO_2 and PM_{10}. Specific data are provided in The Air Quality Model Technical Support Document (ALL 2006), for air quality impacts at all receptor groups. In this presentation, the impact from one source group would not likely be at the same receptor as that of the other source group; therefore the results for each group are not arithmetically additive to obtain an overall impact.

The results show a predicted impact from the Tongue River Railroad emissions for the 1-hour Montana NO_2 standard, about 50 percent of that standard. This result may be due partially to the relationship between the source characterization and the receptor grid. The Tongue River Railroad is presumed to operate in the ADY.

The potential impacts from all sources on the near-field receptor grid do increase over the base year, but overall the NOx emissions from the alternatives show a higher impact for Alternative E than for the other alternatives for the one-hour standard. When evaluating the potential impacts of the alternatives alone, the emissions do not lead to substantial differences among them for the annual or 1-hour NO_2 potential impacts. This discrepancy can be explained by the areal distribution of potential impacts, which for Alternative E would include areas already impacted by existing sources.

For the annual NO_2 potential impacts in Montana the Tongue River Railroad and the CBNG operation play the major role, but are clearly well below the NAAQS and even the comparative PSD annual NO_2 increment. These data are provided for comparison only and do not represent a regulatory PSD Increment Consumption Analysis.

Figure 3-1 also provides results for PM_{10}, $PM_{2.5}$ and SO_2. The results show a relatively high impact from the Tongue River Railroad and from MT CBM operations but all potential impacts are well below any standards. The NO_2 potential impacts would be the major concern regarding the development of the alternatives, on the Montana near-field grid.

Impacts at Near-field Receptors in Wyoming

Results for the Wyoming near-field receptors are provided in Figure 3-2. In Wyoming the coal operations led to modeled impacts on PM_{10} levels that are above the NAAQS for the 24-hour period (150 $\mu g/m^3$), for the base year as well as for ADY. The modeled impacts are nearly double the standard for the base year scenario. The remaining data show that potential impacts are well below the ambient air quality standards. The Wyoming coal operations are largely responsible for the predicted impacts for all scenarios, although non-coal sources do contribute a notable portion of the impact.

The potential impacts of NO_2 are generally about 40 percent of the annual standard, with no real difference for the alternatives analyzed in the ADY. The coal sources are the largest contributor to the maximum NO_2 potential impacts, however, CBNG and non-coal sources also have contributions. Potential impacts of NO_2 are above the Class II PSD increment at the maximum receptors in Wyoming.

The potential impacts of SO_2 emissions are well below the ambient standards and PSD increments for all scenarios. The potential impacts from power plants do, however, show substantial increases in impacts at the maximum power plant receptor. Those potential impacts are, however, still well below the ambient standards and PSD increments. These data are provided for comparison only and do not represent a regulatory PSD Increment Consumption Analysis.

Air Quality Impacts at Class I Area Receptors

As discussed in Chapter 2, the potential impacts at Class I areas were also modeled, with separate assessments for each Class I receptor group. The Class I area with the highest potential impacts was the Northern Cheyenne Indian Reservation in Montana. Those results are provided in Figure 3-3. The potential impacts are all well below the ambient standards, and also are less than the respective PSD increments.

Data for two other Class I areas are also presented (the Theodore Roosevelt National Park in Figure 3-4

and the Wind Cave National Park in Figure 3-5) as these two Class I areas represent the closest Class I areas east of the development area, and should provide a representative depiction of potential impacts at the Class I areas in western North Dakota and western South Dakota. For all areas, all potential impacts are well below the ambient standards, and are also well below the PSD increments for all pollutants modeled. It is also important to note that the comparative impacts for the ADY show little differentiation in potential impacts among the alternatives. The base year 24-hour PM_{10} impact at Theodore Roosevelt was 5.2 $\mu g/m^3$, and the impact at Wind Cave was 6.4 $\mu g/m^3$, against a Class I PSD increment of 8 $\mu g/m^3$. These data are provided for comparison only and do not reprcsent a regulatory PSD Increment Consumption Analysis.

Air Quality Impacts at Sensitive Class II Area Receptors

Potential impacts at the Crow Indian Reservation are higher than potential impacts at the other identified Class II area receptor groups for all scenarios. Figure 3-6 provides a depiction of results similar to those provided above. For this receptor group, modeled impacts are all well below the ambient standards and they are below the established Class II PSD increments, except for potential impacts on the 24-hour PM_{10} levels. Again, there is little difference in impact among the proposed alternative development scenarios.

The other nearby Class II receptor group is the Cloud Peak Wilderness Area in north Central Wyoming, just west of the PRB. Results for this receptor group are shown in Figure 3-7. All potential impacts are well below applicable standards for all scenarios, and potential impacts are less than the Class II PSD increments for all scenarios. The 24-hour PM_{10} potential impacts reach 5 $\mu g/m^3$ for the base year, but this is less than the comparable PSD increment of 30 $\mu g/m^3$. The greatest percentage increases arise from coal and power plant operations, but these increases still do not exceed ambient standards or PSD increments. Data is also presented for the Bighorn Canyon National Recreation Area (Figure 3-8) and the Wind River Indian Reservation (Figure (3-9). For both of these Class II areas, potential impacts are well below applicable standards for all scenarios, and potential impacts are less than the Class II PSD increments for all scenarios. These data are provided for comparison only and do not represent a regulatory PSD Increment Consumption Analysis.

Impacts on Visibility

Under the Clean Air Act, visibility has been established as a critical resource for identified Class I areas. The study provides an analysis of potential impacts at the Class I areas and at sensitive Class II areas in the region. Under the guidance of the Federal Land Managers Air Quality Workgroup (FLAG), the potential impacts were provided using the CALPUFF modeling system and the Method 6 approach, which uses monthly relative humidity values for representative receptor groups.

Visibility potential impacts are based on the highest 24-hour calculated extinction at the indicated source receptors. Potential impacts are based on a presumed pristine background and calculated as a percent increase in extinction (reduced visibility) from that background value. The study tabulated the reduced visibility at the maximum impact receptor in each of the Class I and Class II groups in terms of the maximum reduction on any one 24-hour period, the number of days annually that showed visibility reductions of 5 percent and 10 percent. These reductions are indicated as reductions in deciviews (0.5 and 1 deciview respectively). A significance threshold of 10 percent has been used in this analysis to evaluate the impact from the source groups.

Table 3-2 provides a listing of potential visibility impacts for the base year for each of the analyzed areas with source contributions provided for all sources combined, all Montana sources, the listed CBM operation and construction potential impacts, and potential impacts from Montana oil and gas operations. More detailed data for contributions from other source groups are provided in Attachment A. For the Class I areas, the maximum potential impacts were determined at the North Cheyenne Indian Reservation, the Wind Cave National Park, and the Badlands National Park in South Dakota. Both of the South Dakota areas are downwind (prevailing wind direction from the west) from the PRB and the sources analyzed in this study. In the base year, model results showed more than 200 days of potential impacts with a change of 10 percent or more in extinction at each of these locations. All Class I areas showed some impact with no fewer than 21 days of impact greater than 1 deciview.

For the Class II areas, the maximum potential impacts were at the Crow Indian Reservation in Montana. Nine other Class II areas showed potential impacts of 1 deciview or more for 200 days or more per year, and these areas also were east (downwind in the prevailing wind direction) of the PRB. The results

showed that there was at least some impact on each of the receptor groups from each of the source groups. Coal operations dominated the potential impacts at the Class II areas, and the potential impacts on the Class I areas were noted for all the source groups.

The results also show that the Montana Oil and Gas operations and construction do not play a significant role in potential visibility impacts at either Class I or sensitive Class II areas. For the base year there are only a few days with visibility potential impacts above 5 deciviews at the Crow Indian Reservation and at the Northern Cheyenne Indian Reservation.

Table 3-3 provides a depiction of the potential impacts of all sources for each of the proposed alternatives. Data are provided for all receptor areas for all sources for each of the alternatives. For most areas, there is no change in impact among the alternatives. For example, at the areas with high potential impacts (Badlands and Theodore Roosevelt National Parks) there is no overall difference among the alternatives. At the Northern Cheyenne Indian Reservation, there is a change of 3 and 8 days respectively (for all sources combined) when comparing the potential impacts of Alternative E to Alternatives F and Alternative H respectively. At the Crow Indian Reservation, a maximum of 365 days per year are impacted for all scenarios. When examining the visibility potential impacts of all Montana sources for each alternative, there is only a change of one or two days of impact above 1.0 deciviews when comparing the potential impacts of these alternatives. The Northern Cheyenne Indian Reservation would see a slight increase in the number of days with potential impacts above 1.0 deciviews (from Alternative E through Alternative H), and the Crow Indian Reservation would continue to see 365 days/year impacted by a 1.0 deciview level. Other visibility impact data are provided in detail in Appendix A.

Impacts on Acid Deposition

Emissions of NO_X and SO_2 can lead to increasing potential impacts of acidic deposition in the region. This analysis evaluates the potential increase in acid deposition as a result of the increased production activity noted above. The base year analysis showed that potential impacts for all listed Class I and Class II areas were below the established thresholds for sulfur and nitrogen deposition, which are 5 kilograms per hectare per year (kg/ha-yr) for sulfur compounds and 3 kg/ha-yr for nitrogen compounds. Table 3-3 provides a summary of base year deposition levels at the sensitive receptor areas. The highest modeled impacts are at the Northern Cheyenne Indian Reservation with nitrogen deposition reaching 0.292 kg/ha-yr, or about 10 percent of the threshold. Maximum sulfur deposition is approximately 0.39 kg/ha-yr at the Northern Cheyenne Indian Reservation, or about 8 percent of the threshold. The table also shows that the contributions from base year CBM and Montana oil and gas operations and construction are minimal at any of the receptor areas.

Additional data are provided for other source groups in Appendix A. Relatively higher deposition rates were noted to the east of the PRB, as a result of the prevailing wind direction in the region. For all receptors and for both sulfur and nitrogen compounds, the combined deposition rates do not exceed the thresholds given in these tables.

For the ADY, potential impacts on acid deposition were calculated for each alternative. Table 3-4 provides a summary listing of potential impacts for each alternative, for all source groups combined. The results show that potential impacts are slightly higher than in the base year, but all potential impacts remain well below the deposition threshold. Potential impacts continue to be highest at the Northern Cheyenne Indian Reservation, with little difference among the alternatives. Total nitrogen potential impacts approach 2 kg/hectare-year, or about two-thirds of the threshold value. Sulfur deposition potential impacts also show little difference among the scenarios, and they approach approximately 10 percent of the threshold value.

Impacts on Sensitive Lake Acid Neutralizing Capacity

The analysis of potential impacts of deposition of acidic substances was carried out in accordance with the screening methodology as provided by the US Forest Service (USFS 2000). Data for lake neutralizing capacity were obtained from the USFS web site, which provides data for the 10 percent ANC values for the individual lakes that were evaluated. The threshold is intended to account for sensitive conditions that may occur with an episodic or seasonal basis. Input data to the analysis include the deposition rates that were modeled for the base year, and the development scenarios analyzed herein.

The input data are provided in Table 3-5 for the analyzed lakes. Results are provided for the base year analysis as well as the predicted development scenarios. The threshold for significance is based on

a 10 percent change in ANC for lakes with an ANC of 25 micro equivalents per liter (ueq/L) and a 1 ueq/L threshold change for lakes with an ANC value of less than 25 ueq/L.

Data on the modeled potential impacts for the lakes analyzed is provided in Table 3-6. All lakes except the Upper Frozen Lake in the Bridger WA have 10 percent ANC values of 25 ueq/L or more, and therefore Upper Frozen Lake is discussed separately below. For the other lakes the modeled percent ANC change is 10 percent or less at all lakes except Florence Lake. For that lake, the analyzed base year impact is 11.7 percent and the predicted impact for the ADY is 12.9 percent for all alternative development scenarios. There is no difference among the scenarios for potential impacts on these pristine lakes.

At Upper Frozen Lake, the base year impact was 2.4 ueq/L, which is more than the threshold value of 1 ueq/L threshold that is established for such lakes. The modeled results for each of the development scenarios show an impact of 2.6 ueq/L for Upper Frozen Lake, a change of only 0.2 ueq/L for that lake. The results show a minimal impact, and no difference in impact, among the alternatives considered for this evaluation.

Analysis of Hazardous Air Pollutant Impacts

The modeling study also addressed HAP potential impacts from sources in the study area. Since the potential impacts were greatest in the near-field receptor grids of both states, only those areas were analyzed for HAP potential impacts. The model was used to develop both 1-hour and annual potential impacts for these emissions. Results of the 1-hour modeled impacts for these modeling efforts were compared to the RELs (USEPA 2005a). Table 3-6 provides an analysis of the short term potential impacts for the six analyzed compounds (benzene, ethyl benzene, formaldehyde, n-hexane, toluene, and xylene) compared to the RELs. Results show that all potential impacts are below the RELs except for formaldehyde in the Wyoming near-field receptor grid. Potential impacts are about 70 percent greater than the established REL for formaldehyde.

The potential impacts for chronic and carcinogenic risks are provided in Table 3-7 for the Montana and Wyoming near-field receptor grids. All potential impacts are well below the non-carcinogenic RfCs, with the maximum comparative impact for formaldehyde at the Wyoming near-field receptors, where those potential impacts are about 66 percent of the established RfC. The potential impacts for carcinogenic risk are also provided in Table 3-8. All potential impacts are well below the 1 in 1 million risk, except for benzene potential impacts in Wyoming, where the potential impacts are about 1.0 to 1.3 X 10^{-5} for the various scenarios. This impact is evident in the base year as well as each of the development scenarios.

Table 3-2
Visibility - Method 6 and Monthly f(RH) values - Base Year

Receptor Set	ALL SOURCES				ALL MT				MT CBM Construction				MT CBM Operation				MT OIL & GAS			
	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}
	5%	10%			5%	10%			5%	10%			5%	10%			5%	10%		
CLASS I AREAS																				
Badlands NP Class I	272	206	219	118	53	20	25	14	0	0	0.1	0.1	0	0	0.1	0.1	0	0	0.7	0.5
Bob Marshall W Class I	28	21	48	30	20	10	34	17	0	0	0.0	0.0	0	0	0.0	0.0	0	0	0.2	0.1
Bridger W Class I	230	152	437	156	38	19	40	18	0	0	0.2	0.0	0	0	0.2	0.1	0	0	0.9	0.2
Fitzpatrick W Class I	157	105	291	129	35	17	58	23	0	0	0.1	0.0	0	0	0.2	0.1	0	0	0.8	0.2
Fort Peck IR Class I	120	79	168	77	55	25	26	17	0	0	0.1	0.0	0	0	0.2	0.1	0	0	2.9	1.0
Gates of the Mountain W Class I	85	52	113	52	66	39	60	34	0	0	0.0	0.0	0	0	0.0	0.0	0	0	0.4	0.2
Grand Teton NP Class I	163	90	180	71	45	19	31	13	0	0	0.1	0.0	0	0	0.1	0.0	0	0	0.5	0.1
North Absaorka W Class I	149	85	229	110	90	41	66	37	0	0	0.2	0.0	0	0	0.3	0.1	0	0	1.1	0.5
North Cheyenne IR Class I	299	234	313	122	192	97	79	33	1	0	6.8	2.2	2	0	9.5	3.1	0	0	2.5	1.3
Red Rock Lakes Class I	96	48	87	49	49	20	41	16	0	0	0.0	0.0	0	0	0.1	0.0	0	0	0.4	0.1
Scapegoat W Class I	47	29	78	48	36	20	52	37	0	0	0.0	0.0	0	0	0.0	0.0	0	0	0.3	0.1
Teton W Class I	149	87	247	108	53	21	64	23	0	0	0.1	0.0	0	0	0.2	0.0	0	0	0.7	0.2
Theodore Roosevelt NP Class I	213	153	356	131	74	33	57	26	0	0	0.2	0.1	0	0	0.3	0.1	0	0	4.6	1.3
UL Bend W Class I	125	62	140	48	79	27	43	21	0	0	0.1	0.0	0	0	0.1	0.0	0	0	0.5	0.4
Washakie W Class I	169	110	335	144	75	38	85	43	0	0	0.2	0.0	0	0	0.3	0.1	0	0	1.1	0.4
Wind Cave NP Class I	320	247	265	147	69	22	24	16	0	0	0.2	0.1	0	0	0.2	0.1	0	0	2.0	0.8
Yellowstone NP Class I	188	102	207	91	102	45	64	30	0	0	0.2	0.0	0	0	0.2	0.0	0	0	1.1	0.2
SENSITIVE CLASS II AREAS																				
Absaorka Beartooth W Class II	201	131	266	109	170	100	135	45	0	0	0.4	0.1	0	0	0.6	0.1	0	0	2.1	0.5
Agate Fossil Beds NM Class II	295	225	401	130	54	14	21	14	0	0	0.1	0.1	0	0	0.2	0.1	0	0	1.0	0.3
Big Horn Canyon NRA Class II	356	295	376	154	200	122	143	63	0	0	1.2	0.6	0	0	1.9	0.9	10	2	24.6	5.8
Black Elk W Class II	306	214	252	144	67	23	22	15	0	0	0.1	0.1	0	0	0.2	0.1	0	0	2.3	0.6
Cloud Peak Class II	201	136	232	162	92	44	34	24	0	0	3.1	0.3	0	0	4.5	0.4	0	0	1.8	0.7
Crow IR Class II	365	360	428	266	365	350	401	165	1	0	5.2	2.6	5	0	7.2	3.4	14	2	18.1	6.7
Devils Tower NM Class II	324	260	268	130	82	29	29	17	0	0	0.2	0.1	0	0	0.3	0.2	0	0	2.2	0.9
Fort Belknap IR Class II	100	52	131	45	56	21	44	26	0	0	0.1	0.0	0	0	0.1	0.0	0	0	0.5	0.3
Fort Laramie NHS Class II	288	244	514	145	48	10	21	13	0	0	0.1	0.0	0	0	0.1	0.1	0	0	1.0	0.4
Jedediah Smith W Class II	167	94	172	59	45	22	31	14	0	0	0.0	0.0	0	0	0.1	0.0	0	0	0	0
Jewel Cave NM Class II	309	238	271	140	65	24	22	14	0	0	0.2	0.1	0	0	0.4	0.1	0	0	2	1
Lee Metcalf W Class II	165	107	138	55	140	87	89	40	0	0	0.1	0.0	0	0	0.1	0.0	0	0	1	0
Mt Naomi W Class II	78	51	195	70	4	1	12	3	0	0	0.0	0.0	0	0	0.1	0.0	0	0	0	0
Mt Rushmore Class II	297	202	248	140	61	23	22	15	0	0	0.1	0.1	0	0	0.2	0.1	0	0	2	1
Popo Agie W Class II	207	136	485	166	37	17	38	17	0	0	0.2	0.1	0	0	0.2	0.1	0	0	1	0
Soldier Creek WA Class II	297	240	396	119	59	18	20	15	0	0	0.1	0.1	0	0	0.2	0.1	0	0	1	0
Wellsville Mountain W Class II	62	36	157	54	1	0	8	2	0	0	0.0	0.0	0	0	0.1	0.0	0	0	0	0
Wind River IR Class II	305	235	546	224	97	44	88	39	0	0	3	2	1	0	5	1	0	0	1	0

Table 3-3
Visibility - Method 6 and Monthly f(RH) values - Future Alternatives

Receptor Set	ALL SOURCES - ALT E				ALL SOURCES - ALT F				ALL SOURCES - ALT H			
	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext
	5%	10%			5%	10%			5%	10%		
CLASS I AREAS												
Badlands NP Class I	283	219	230	125	283	219	230	125	283	219	230	125
Bob Marshall W Class I	46	28	60	42	46	28	60	42	46	28	60	42
Bridger W Class I	225	146	456	152	225	146	456	152	225	147	456	152
Fitzpatrick W Class I	157	109	318	128	157	109	318	128	157	109	318	128
Fort Peck IR Class I	154	92	169	82	154	91	169	82	154	92	169	82
Gates of the Mountain W Class I	103	69	118	92	103	69	118	91	103	69	118	92
Grand Teton NP Class I	165	92	182	77	165	92	182	76	165	93	182	77
North Absaorka W Class I	161	90	256	129	161	90	255	129	161	90	256	129
North Cheyenne IR Class I	361	325	338	175	362	328	338	178	362	333	339	180
Red Rock Lakes Class I	99	50	94	53	99	50	94	53	99	50	94	53
Scapegoat W Class I	68	48	113	68	68	48	113	68	68	48	113	68
Teton W Class I	154	92	268	120	154	92	267	119	154	92	268	120
Theodore Roosevelt NP Class I	232	172	356	136	232	172	356	136	232	172	356	136
UL Bend W Class I	176	99	154	60	176	97	153	60	176	99	154	60
Washakie W Class I	178	115	368	152	177	115	368	152	178	115	369	152
Wind Cave NP Class I	325	262	275	147	325	262	275	147	325	262	276	147
Yellowstone NP Class I	193	105	226	97	193	105	225	97	193	105	226	97
SENSITIVE CLASS II AREAS												
Absaorka Beartooth W Class II	213	137	303	127	213	137	302	126	213	137	303	128
Agate Fossil Beds NM Class II	297	237	399	133	297	237	399	133	297	237	399	134
Big Horn Canyon NRA Class II	356	298	411	185	356	298	409	185	356	298	410	185
Black Elk W Class II	318	233	270	150	318	233	270	150	318	233	270	150
Cloud Peak Class II	216	147	239	177	216	146	239	176	216	147	239	177
Crow IR Class II	365	365	578	259	365	365	577	253	365	365	578	257
Devils Tower NM Class II	328	279	278	135	328	279	278	134	328	279	278	135
Fort Belknap IR Class II	173	92	143	54	172	92	143	54	173	92	143	54
Fort Laramie NHS Class II	296	249	537	151	296	249	537	150	296	249	537	151
Jedediah Smith W Class II	169	96	174	66	169	95	174	66	169	96	174	66
Jewel Cave NM Class II	320	252	293	142	320	252	293	142	320	252	293	142
Lee Metcalf W Class II	175	114	153	62	175	114	152	62	175	114	153	62
Mt Naomi W Class II	80	52	198	70	80	52	198	70	80	52	198	70
Mt Rushmore Class II	312	221	262	147	311	221	262	147	312	221	262	147
Popo Agie W Class II	211	137	502	164	211	137	502	164	211	138	502	165
Soldier Creek WA Class II	299	245	396	126	299	245	396	126	299	245	396	126
Wellsville Mountain W Class II	64	40	161	57	64	40	161	57	64	40	161	57
Wind River IR Class II	310	243	566	214	310	243	565	214	311	243	566	214

Table 3-3 (continued)
Visibility - Method 6 and Monthly f(RH) values - Future Alternatives

Receptor Set	MT CBM Construction - ALT E				MT CBM Construction - ALT F				MT CBM Construction - ALT H			
	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext
	5%	10%			5%	10%			5%	10%		
CLASS I AREAS												
Badlands NP Class I	0	0	0.2	0.1	0	0	0.4	0.3	0	0	0.5	0.3
Bob Marshall W Class I	0	0	0.1	0.0	0	0	0.1	0.0	0	0	0.3	0.1
Bridger W Class I	0	0	0.3	0.1	0	0	0.5	0.2	0	0	0.6	0.3
Fitzpatrick W Class I	0	0	0.3	0.1	0	0	0.5	0.2	0	0	0.9	0.4
Fort Peck IR Class I	0	0	0.7	0.2	0	0	0.7	0.3	0	0	2.6	0.6
Gates of the Mountain W Class I	0	0	0.4	0.1	0	0	0.3	0.1	0	0	1.4	0.4
Grand Teton NP Class I	0	0	0.2	0.1	0	0	0.3	0.1	0	0	0.4	0.2
North Absaorka W Class I	0	0	0.5	0.3	0	0	1.1	0.4	0	0	1.3	0.8
North Cheyenne IR Class I	0	0	2.4	0.9	50	8	19.1	10.0	122	26	30.8	16.1
Red Rock Lakes Class I	0	0	0.3	0.1	0	0	0.3	0.1	0	0	1.1	0.2
Scapegoat W Class I	0	0	0.2	0.1	0	0	0.2	0.1	0	0	0.7	0.2
Teton W Class I	0	0	0.3	0.1	0	0	0.5	0.1	0	0	0.9	0.3
Theodore Roosevelt NP Class I	0	0	0.8	0.3	0	0	1.1	0.5	0	0	2.1	0.8
UL Bend W Class I	0	0	0.3	0.2	0	0	0.7	0.2	0	0	0.9	0.7
Washakie W Class I	0	0	0.7	0.3	0	0	0.7	0.4	0	0	1.5	0.7
Wind Cave NP Class I	0	0	0.3	0.1	0	0	0.6	0.3	0	0	0.6	0.3
Yellowstone NP Class I	0	0	0.4	0.2	0	0	0.9	0.2	0	0	1.6	0.6
SENSITIVE CLASS II AREAS												
Absaorka Beartooth W Class II	0	0	3.6	1.2	0	0	2.0	0.6	0	0	2.5	1.4
Agate Fossil Beds NM Class II	0	0	0.2	0.1	0	0	0.4	0.2	0	0	0.4	0.2
Big Horn Canyon NRA Class II	1	0	8.4	3.4	0	0	3.1	1.4	0	0	2.0	1.0
Black Elk W Class II	0	0	0.3	0.1	0	0	0.3	0.1	0	0	0.3	0.1
Cloud Peak Class II	0	0	1.3	0.4	0	0	2.5	0.6	0	0	2.2	0.5
Crow IR Class II	166	117	110.0	60.7	106	34	31.5	17.4	64	21	29.4	19.5
Devils Tower NM Class II	0	0	0.6	0.2	0	0	0.9	0.5	0	0	0.8	0.4
Fort Belknap IR Class II	0	0	0.3	0.1	0	0	0.6	0.2	0	0	1.0	0.5
Fort Laramie NHS Class II	0	0	0.2	0.1	0	0	0.4	0.2	0	0	0.4	0.2
Jedediah Smith W Class II	0	0	0.1	0.1	0	0	0.3	0.1	0	0	0.3	0.1
Jewel Cave NM Class II	0	0	0.3	0.1	0	0	0.6	0.3	0	0	0.5	0.3
Lee Metcalf W Class II	0	0	0.5	0.2	0	0	0.6	0.2	0	0	1.9	0.6
Mt Naomi W Class II	0	0	0.1	0.0	0	0	0.1	0.0	0	0	0.2	0.0
Mt Rushmore Class II	0	0	0.3	0.1	0	0	0.6	0.3	0	0	0.6	0.3
Popo Agie W Class II	0	0	0.3	0.2	0	0	0.5	0.2	0	0	0.6	0.3
Soldier Creek WA Class II	0	0	0.2	0.1	0	0	0.5	0.2	0	0	0.4	0.3
Wellsville Mountain W Class II	0	0	0.1	0.0	0	0	0.1	0.0	0	0	0.2	0.0
Wind River IR Class II	0	0	0.5	0.3	0	0	0.8	0.4	0	0	1.5	0.7

Table 3-3 (continued)
Visibility - Method 6 and Monthly f(RH) values - Future Alternatives

Receptor Set	MT CBM Operation - ALT E				MT CBM Operation - ALT F				MT CBM Operation - ALT H			
	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext
	5%	10%			5%	10%			5%	10%		
CLASS I AREAS	**CLASS I AREAS**											
Badlands NP Class I	2	0	6.7	3.9	1	0	6.4	3.7	2	0	6.5	3.7
Bob Marshall W Class I	0	0	1.5	0.5	0	0	1.4	0.4	0	0	1.5	0.5
Bridger W Class I	2	0	8.3	2.7	2	0	7.8	2.4	2	0	8.2	2.6
Fitzpatrick W Class I	2	0	8.9	2.4	2	0	8.2	2.2	2	0	8.7	2.3
Fort Peck IR Class I	7	1	10.2	5.0	6	0	9.4	4.1	6	0	9.9	4.9
Gates of the Mountain W Class I	0	0	4.1	1.1	0	0	3.5	0.9	0	0	3.9	1.0
Grand Teton NP Class I	0	0	4.9	1.2	0	0	4.5	1.1	0	0	4.8	1.2
North Absaorka W Class I	8	3	14.9	5.7	8	3	14.1	5.1	8	3	14.5	5.5
North Cheyenne IR Class I	296	215	130.4	61.8	294	206	125.3	59.0	328	240	118.7	63.5
Red Rock Lakes Class I	0	0	4.1	0.9	0	0	3.9	0.8	0	0	4.1	0.8
Scapegoat W Class I	0	0	2.5	0.8	0	0	2.2	0.7	0	0	2.4	0.8
Teton W Class I	3	0	7.8	2.2	3	0	7.2	2.0	3	0	7.6	2.1
Theodore Roosevelt NP Class I	11	2	15.0	6.8	11	2	13.6	6.2	11	2	14.4	6.6
UL Bend W Class I	6	1	10.2	3.5	6	0	9.6	3.2	6	0	9.9	3.4
Washakie W Class I	10	3	12.0	5.8	8	3	11.1	5.4	9	3	11.7	5.5
Wind Cave NP Class I	8	0	8.4	5.0	6	0	7.8	4.5	7	0	8.3	4.8
Yellowstone NP Class I	5	1	13.2	2.5	3	1	12.3	2.2	4	1	12.9	2.3
SENSITIVE CLASS II AREAS												
Absaorka Beartooth W Class II	12	4	33.1	6.5	10	3	31.3	6.0	12	4	32.1	6.2
Agate Fossil Beds NM Class II	1	0	5.3	2.5	0	0	4.9	2.3	1	0	5.2	2.4
Big Horn Canyon NRA Class II	45	24	34.8	17.7	37	18	30.5	14.2	52	27	33.9	18.2
Black Elk W Class II	6	0	8.8	4.7	4	0	8.2	4.4	6	0	8.7	4.5
Cloud Peak Class II	22	9	71.1	10.9	21	8	68.4	10.2	21	9	70.2	10.6
Crow IR Class II	228	131	133.6	54.1	205	115	129.2	46.0	331	257	240.5	128.8
Devils Tower NM Class II	11	2	10.9	6.7	11	1	10.2	6.3	11	1	10.6	6.6
Fort Belknap IR Class II	3	0	8.5	2.9	3	0	7.9	2.5	3	0	8.2	2.9
Fort Laramie NHS Class II	3	0	5.8	2.7	1	0	5.5	2.4	2	0	5.7	2.6
Jedediah Smith W Class II	0	0	3.9	1.3	0	0	3.7	1.2	0	0	3.9	1.3
Jewel Cave NM Class II	6	0	9.4	4.0	6	0	8.7	3.6	6	0	9.2	3.9
Lee Metcalf W Class II	1	0	8.2	1.9	1	0	7.6	1.5	1	0	8.0	1.8
Mt Naomi W Class II	0	0	2.3	0.4	0	0	2.1	0.4	0	0	2.2	0.4
Mt Rushmore Class II	6	0	8.5	4.5	4	0	7.9	4.3	6	0	8.3	4.4
Popo Agie W Class II	4	0	9.1	3.3	3	0	8.5	3.0	4	0	9.0	3.2
Soldier Creek WA Class II	1	0	6.2	3.1	1	0	5.8	2.9	1	0	6.1	3.0
Wellsville Mountain W Class II	0	0	2.1	0.3	0	0	2.0	0.3	0	0	2.1	0.3
Wind River IR Class II	9	4	13.2	6.0	9	3	12.2	5.6	9	4	12.9	5.8

Table 3-4
Modeled Deposition for Nitrogen and Sulfur - Base Year

Note: Bold type indicate a modeled impact that is above the Comparative Deposition Value

Receptor Set	POLLUTANT	*Maximum Deposition (kg/ha - yr)*				
		ALL SOURCES	*MT CBM Construction*	*MT CBM Operation*	*MT Oil & Gas*	Threshold
CLASS I AREAS						
Badlands NP Class I Area	Nitrogen	1.13E-01	2.75E-05	4.49E-05	5.05E-04	3
	Sulfur	1.63E-01	5.03E-06	2.37E-06	1.30E-05	5
Bridger W Class I Area	Nitrogen	1.18E-02	1.57E-06	2.54E-06	4.20E-05	3
	Sulfur	1.96E-02	3.22E-07	1.53E-07	1.03E-06	5
Bob Marshall W Class I Area	Nitrogen	1.17E-01	7.53E-06	1.26E-05	4.67E-05	3
	Sulfur	2.09E-01	1.84E-06	8.70E-07	1.10E-06	5
Fitzpatrick W Class I Area	Nitrogen	1.29E-01	7.41E-06	1.23E-05	6.05E-05	3
	Sulfur	1.72E-01	1.58E-06	7.51E-07	1.37E-06	5
Fort Peck IR Class I Area	Nitrogen	7.10E-02	1.52E-05	2.49E-05	6.00E-03	3
	Sulfur	1.33E-01	2.36E-06	1.12E-06	2.31E-05	5
Gates of the Mountain W Class I Area	Nitrogen	6.70E-02	4.46E-06	7.22E-06	1.48E-04	3
	Sulfur	8.11E-02	7.96E-07	3.79E-07	2.69E-06	5
Grand Teton NP Class I Area	Nitrogen	6.36E-02	5.46E-06	8.94E-06	4.47E-05	3
	Sulfur	1.69E-01	8.99E-07	4.27E-07	9.17E-07	5
North Absaorka W Class I Are	Nitrogen	1.21E-01	1.51E-05	2.50E-05	3.31E-04	3
	Sulfur	1.97E-01	2.73E-06	1.28E-06	2.97E-06	5
North Cheyenne IR Class I Area	Nitrogen	2.92E-01	4.29E-03	7.15E-03	5.48E-03	3
	Sulfur	3.91E-01	3.76E-04	1.78E-04	2.92E-05	5
Red Rock Lakes Class I Area	Nitrogen	4.36E-02	2.76E-06	4.52E-06	3.59E-05	3
	Sulfur	6.13E-02	4.27E-07	2.03E-07	6.39E-07	5
Scapegoat W Class I Area	Nitrogen	2.76E-02	3.08E-06	4.95E-06	2.62E-04	3
	Sulfur	4.44E-02	5.69E-07	2.70E-07	2.23E-06	5
Teton W Class I Area	Nitrogen	7.98E-02	7.92E-06	1.31E-05	9.97E-05	3
	Sulfur	1.51E-01	1.51E-06	7.13E-07	1.51E-06	5
Theodore Roosevelt NP Class I Area	Nitrogen	2.50E-01	2.79E-05	4.60E-05	2.89E-03	3
	Sulfur	3.39E-01	4.42E-06	2.10E-06	5.01E-05	5
UL Bend W Class I Area	Nitrogen	6.46E-02	1.19E-05	1.92E-05	3.86E-04	3
	Sulfur	9.09E-02	2.10E-06	9.98E-07	6.00E-06	5
Washakie W Class I Area	Nitrogen	1.17E-01	1.12E-05	1.86E-05	2.19E-04	3
	Sulfur	2.18E-01	2.15E-06	1.01E-06	2.44E-06	5
Wind Cave NP Class I Area	Nitrogen	1.96E-01	3.71E-05	6.40E-05	5.21E-04	3
	Sulfur	3.21E-01	7.02E-06	3.33E-06	1.37E-05	5
Yellowstone NP Class I Area	Nitrogen	8.02E-02	1.39E-05	2.30E-05	1.26E-04	3
	Sulfur	1.28E-01	2.16E-06	1.01E-06	1.85E-06	5
CLASS I / CLASS II SENSITIVE LAKES						
Black Joe Lake, Bridger WA	Nitrogen	9.64E-02	7.41E-06	1.24E-05	4.44E-05	3
	Sulfur	1.90E-01	1.81E-06	8.59E-07	1.08E-06	5
Deep Lake, Bridger WA	Nitrogen	9.87E-02	7.25E-06	1.21E-05	4.32E-05	3
	Sulfur	1.91E-01	1.78E-06	8.42E-07	1.06E-06	5
Emerald Lake, Cloud Peak WA	Nitrogen	1.52E-01	1.45E-04	2.60E-04	4.33E-04	3
	Sulfur	2.08E-01	2.07E-05	9.82E-06	6.16E-06	5
Florence, Cloud Peak WA,	Nitrogen	1.58E-01	1.37E-04	2.52E-04	4.27E-04	3
	Sulfur	2.16E-01	2.10E-05	9.95E-06	6.39E-06	5
Hobbs Lake, Bridger WA	Nitrogen	8.95E-02	5.54E-06	9.13E-06	3.68E-05	3
	Sulfur	1.69E-01	1.23E-06	5.83E-07	9.59E-07	5
Lower Saddlebag, Popo Agie WA	Nitrogen	1.16E-01	8.05E-06	1.36E-05	4.48E-05	3
	Sulfur	2.21E-01	1.96E-06	9.27E-07	1.07E-06	5
Ross Lake, Cloud Peak WA	Nitrogen	8.88E-02	6.93E-06	1.14E-05	5.09E-05	3
	Sulfur	1.64E-01	1.40E-06	6.63E-07	1.19E-06	5
Upper Frozen Lake, Bridger WA	Nitrogen	1.04E-01	7.18E-06	1.20E-05	4.20E-05	3
	Sulfur	1.97E-01	1.76E-06	8.34E-07	1.03E-06	5

Table 3-5
Maximum Deposition for Alternate Development Scenarios

Receptor Set	POLLUTANT	*Maximum Deposition (kg/ha - yr)*			
		ALL SOURCES - Alternative E	*ALL SOURCES - Alternative F*	*ALL SOURCES - Alternative H*	*Threshold*
CLASS I AREAS					
Badlands NP Class I Area	Nitrogen	1.20E-01	1.20E-01	1.20E-01	3
	Sulfur	1.83E-01	1.83E-01	1.83E-01	5
Bridger W Class I Area	Nitrogen	1.79E-02	1.78E-02	1.79E-02	3
	Sulfur	2.70E-02	2.70E-02	2.70E-02	5
Bob Marshall W Class I Area	Nitrogen	1.14E-01	1.14E-01	1.14E-01	3
	Sulfur	2.38E-01	2.38E-01	2.38E-01	5
Fitzpatrick W Class I Area	Nitrogen	1.30E-01	1.30E-01	1.30E-01	3
	Sulfur	1.87E-01	1.87E-01	1.88E-01	5
Fort Peck IR Class I Area	Nitrogen	7.93E-02	7.90E-02	7.95E-02	3
	Sulfur	1.46E-01	1.46E-01	1.46E-01	5
Gates of the Mountain W Class I Area	Nitrogen	9.39E-02	9.37E-02	9.39E-02	3
	Sulfur	1.11E-01	1.11E-01	1.11E-01	5
Grand Teton NP Class I Area	Nitrogen	6.53E-02	6.53E-02	6.53E-02	3
	Sulfur	1.78E-01	1.78E-01	1.78E-01	5
North Absaorka W Class I Are	Nitrogen	1.30E-01	1.30E-01	1.30E-01	3
	Sulfur	2.13E-01	2.13E-01	2.13E-01	5
North Cheyenne IR Class I Area	Nitrogen	1.87E+00	1.97E+00	1.99E+00	3
	Sulfur	4.88E-01	4.89E-01	4.92E-01	5
Red Rock Lakes Class I Area	Nitrogen	4.55E-02	4.55E-02	4.56E-02	3
	Sulfur	6.52E-02	6.52E-02	6.52E-02	5
Scapegoat W Class I Area	Nitrogen	4.13E-02	4.12E-02	4.14E-02	3
	Sulfur	6.12E-02	6.12E-02	6.12E-02	5
Teton W Class I Area	Nitrogen	8.36E-02	8.34E-02	8.36E-02	3
	Sulfur	1.61E-01	1.61E-01	1.61E-01	5
Theodore Roosevelt NP Class I Area	Nitrogen	2.58E-01	2.58E-01	2.58E-01	3
	Sulfur	3.53E-01	3.53E-01	3.53E-01	5
UL Bend W Class I Area	Nitrogen	9.11E-02	9.07E-02	9.15E-02	3
	Sulfur	1.23E-01	1.23E-01	1.23E-01	5
Washakie W Class I Area	Nitrogen	1.25E-01	1.24E-01	1.25E-01	3
	Sulfur	2.37E-01	2.37E-01	2.38E-01	5
Wind Cave NP Class I Area	Nitrogen	2.07E-01	2.07E-01	2.07E-01	3
	Sulfur	3.58E-01	3.58E-01	3.58E-01	5
Yellowstone NP Class I Area	Nitrogen	8.58E-02	8.56E-02	8.58E-02	3
	Sulfur	1.36E-01	1.36E-01	1.36E-01	5
CLASS I / CLASS II SENSITIVE LAKES					
Black Joe Lake, Bridger WA	Nitrogen	9.63E-02	9.62E-02	9.63E-02	3
	Sulfur	2.15E-01	2.15E-01	2.15E-01	5
Deep Lake, Bridger WA	Nitrogen	9.81E-02	9.81E-02	9.82E-02	3
	Sulfur	2.16E-01	2.16E-01	2.16E-01	5
Emerald Lake, Cloud Peak WA	Nitrogen	1.65E-01	1.64E-01	1.65E-01	3
	Sulfur	2.34E-01	2.34E-01	2.34E-01	5
Florence, Cloud Peak WA,	Nitrogen	1.70E-01	1.69E-01	1.70E-01	3
	Sulfur	2.43E-01	2.43E-01	2.43E-01	5
Hobbs Lake, Bridger WA	Nitrogen	8.83E-02	8.82E-02	8.83E-02	3
	Sulfur	1.82E-01	1.82E-01	1.82E-01	5
Lower Saddlebag, Popo Agie WA	Nitrogen	1.15E-01	1.15E-01	1.15E-01	3
	Sulfur	2.55E-01	2.55E-01	2.55E-01	5
Ross Lake, Cloud Peak WA	Nitrogen	8.94E-02	8.94E-02	8.95E-02	3
	Sulfur	1.76E-01	1.76E-01	1.76E-01	5
Upper Frozen Lake, Bridger WA	Nitrogen	1.03E-01	1.03E-01	1.03E-01	3
	Sulfur	2.22E-01	2.22E-01	2.22E-01	5

Table 3-6
Modeled Impacts on Acid Sensitive Lakes -Alternate Development Scenarios

Wilderness Area / Lake	Background ANC (ueq/l)	Number of Samples	Watershed Area (ha)	Annual Precipitation (meter)	Base Year ANC(o) (eq)	Base Year %ANC change	Base Year Hdep ueq/l	Alternative E %ANC change	Alternative E Hdep ueq/l	Alternative F %ANC change	Alternative F Hdep ueq/l	Alternative H %ANC change	Alternative H Hdep ueq/l
Bridger													
Black Joe	67	43	890	0.97	397109	4.2	2.9	4.6	3.1	4.6	3.1	4.6	3.1
Deep	60	61	205	0.97	80864	4.8	2.9	5.2	3.2	5.2	3.2	5.2	3.2
Hobbs	70	68	293	0.76	101715	4.9	3.3	5.1	3.5	5.1	3.5	5.1	3.5
Upper Frozen	5	(NA)	64.8	1.22	1033	123.9	2.4	133.1	2.6	133.1	2.6	133.1	2.6
Cloud Peak													
Emerald	55.3	9	293	0.97	104776	6.7	3.7	7.4	4.1	7.4	4.1	7.4	4.1
Florence	32.7	10	417	0.97	88177	11.7	3.8	12.9	4.2	12.9	4.2	12.9	4.2
Fitzpatrick													
Ross	53.5	35	4455	0.97	1768834	4.2	2.6	4.4	2.7	4.4	2.7	4.4	2.7
Popo Agie													
Lower Saddlebag	55.5	34	155	0.97	55628	6.2	3.4	6.7	3.7	6.7	3.7	6.7	3.7

Table 3-7
Modeled Acute Concentrations of Hazardous Air Pollutants (HAPs)
All Production Scenarios - All Sources

Receptor Set	*Pollutant*	*Averag ing Period*	*RANK*	*Base Year*	*ALT E Total Impact*	*ALT F Total Impact*	*ALT H Total Impact*	*REL (μg/m3)*
Near Field Receptors All Data in μg/m³								
Montana Near Field Receptors	Benzene	1-hour	1ST HIGH	0.29	0.36	0.31	0.30	1,300
	Ethyl Benzene	1-hour	1ST HIGH	0.01	0.01	0.01	0.01	35,000
	Formaldehyde	1-hour	1ST HIGH	13.3	16.6	14.2	13.8	94
	n-Hexane	1-hour	1ST HIGH	4.44	207.00	207.00	207.00	39,000
	Toluene	1-hour	1ST HIGH	0.2	0.3	0.3	0.3	37,000
	Xylene	1-hour	1ST HIGH	0.1	0.1	0.1	0.1	22,000
Wyoming Near Field Receptors	Benzene	1-hour	1ST HIGH	1.9	1.0	1.0	1.0	1,300
	Ethyl Benzene	1-hour	1ST HIGH	0.1	0.04	0.0	0.0	35,000
	Formaldehyde	1-hour	1ST HIGH	86.2	46.5	46.5	46.5	94
	n-Hexane	1-hour	1ST HIGH	3.1	12.8	12.8	12.8	39,000
	Toluene	1-hour	1ST HIGH	1.0	0.5	0.5	0.5	37,000
	Xylene	1-hour	1ST HIGH	0.4	0.2	0.2	0.2	22,000

Table 3-8
Modeled Annual Concentrations of Hazardous Air Pollutants (HAPs) - All Production Scenarios
All Sources

Receptor Set	Pollutant	Averaging Period*	RANK	Base Year	ALT E Total Impact	ALT F Total Impact	ALT H Total Impact	Non-Carcinogenic RfCs
Near Field Receptors - Non-Carcinogenic Impacts								**All Data in µg/m³**
Montana Near Field Receptors	Benzene	Annual	1ST HIGH	0.0026	0.0031	0.0031	0.0032	30
	Ethyl Benzene	Annual	1ST HIGH	0.0001	0.0001	0.0001	0.0001	1,000
	Formaldehyde	Annual	1ST HIGH	0.1210	0.1400	0.1400	0.1400	9.8
	n-Hexane	Annual	1ST HIGH	0.1250	1.6000	1.6000	1.6000	200
	Toluene	Annual	1ST HIGH	0.0001	0.0034	0.0034	0.0034	400
	Xylene	Annual	1ST HIGH	0.0006	0.0006	0.0006	0.0006	100
Wyoming Near Field Receptors	Benzene	Annual	1ST HIGH	0.0093	0.0055	0.0055	0.0055	30
	Ethyl Benzene	Annual	1ST HIGH	0.0004	0.0003	0.0003	0.0003	1,000
	Formaldehyde	Annual	1ST HIGH	0.4270	0.2390	0.2390	0.2390	9.8
	n-Hexane	Annual	1ST HIGH	0.0562	0.0826	0.0826	0.0826	200
	Toluene	Annual	1ST HIGH	0.0049	0.0028	0.0028	0.0028	400
	Xylene	Annual	1ST HIGH	0.0020	0.0011	0.0011	0.0011	100

Near Field Receptors - Carcinogenic Risk Evaluation*				**Risk Evaluation X 10^{-6}**			
Montana	Benzene	Annual	1ST HIGH	0.015	0.017	0.017	0.017
	Formaldehyde	Annual	1ST HIGH	0.000	0.001	0.001	0.001
Wyoming	Benzene	Annual	1ST HIGH	0.052	0.030	0.030	0.030
	Formaldehyde	Annual	1ST HIGH	0.002	0.001	0.001	0.001

*Benzene Concentrations multiplied by risk factor: 7.8 X 10^{-6} X 0.71)
*Formaldehyde Concentrations multiplied by risk factor: 5.5 X 10^{-9} X 0.71)

Figure 3-1
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Montana Near-field Receptors

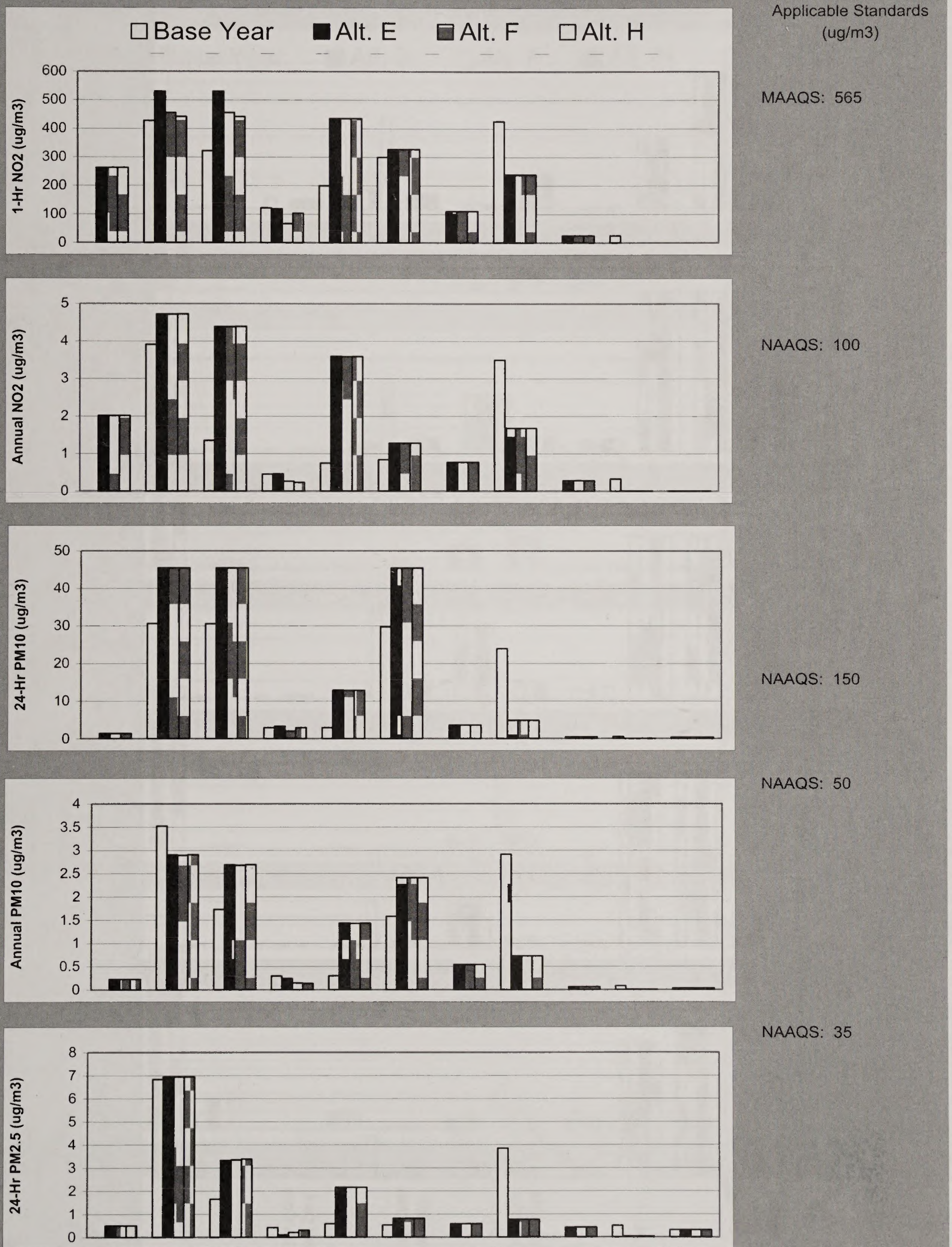


Figure 3-1 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Montana Near-field Receptors

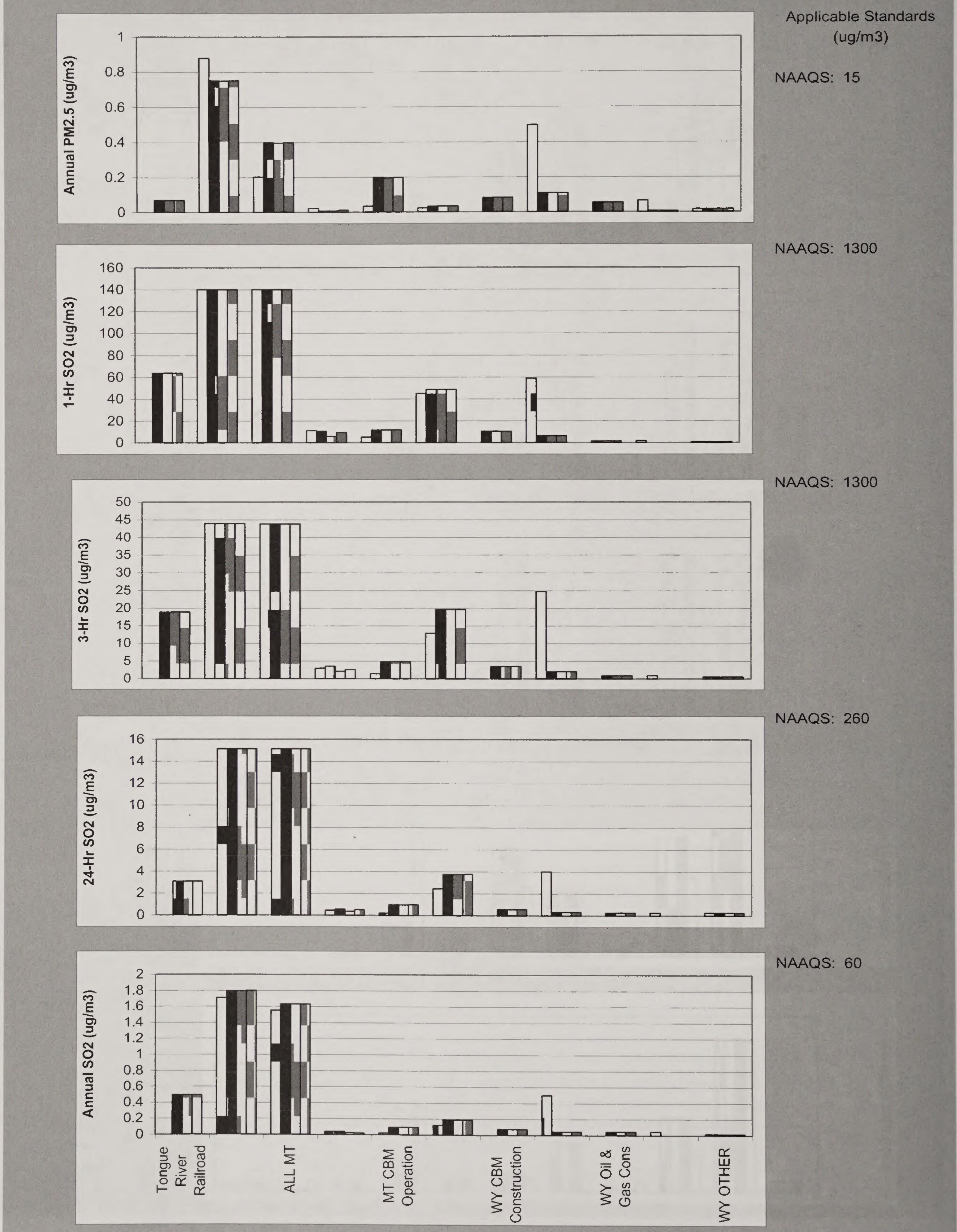
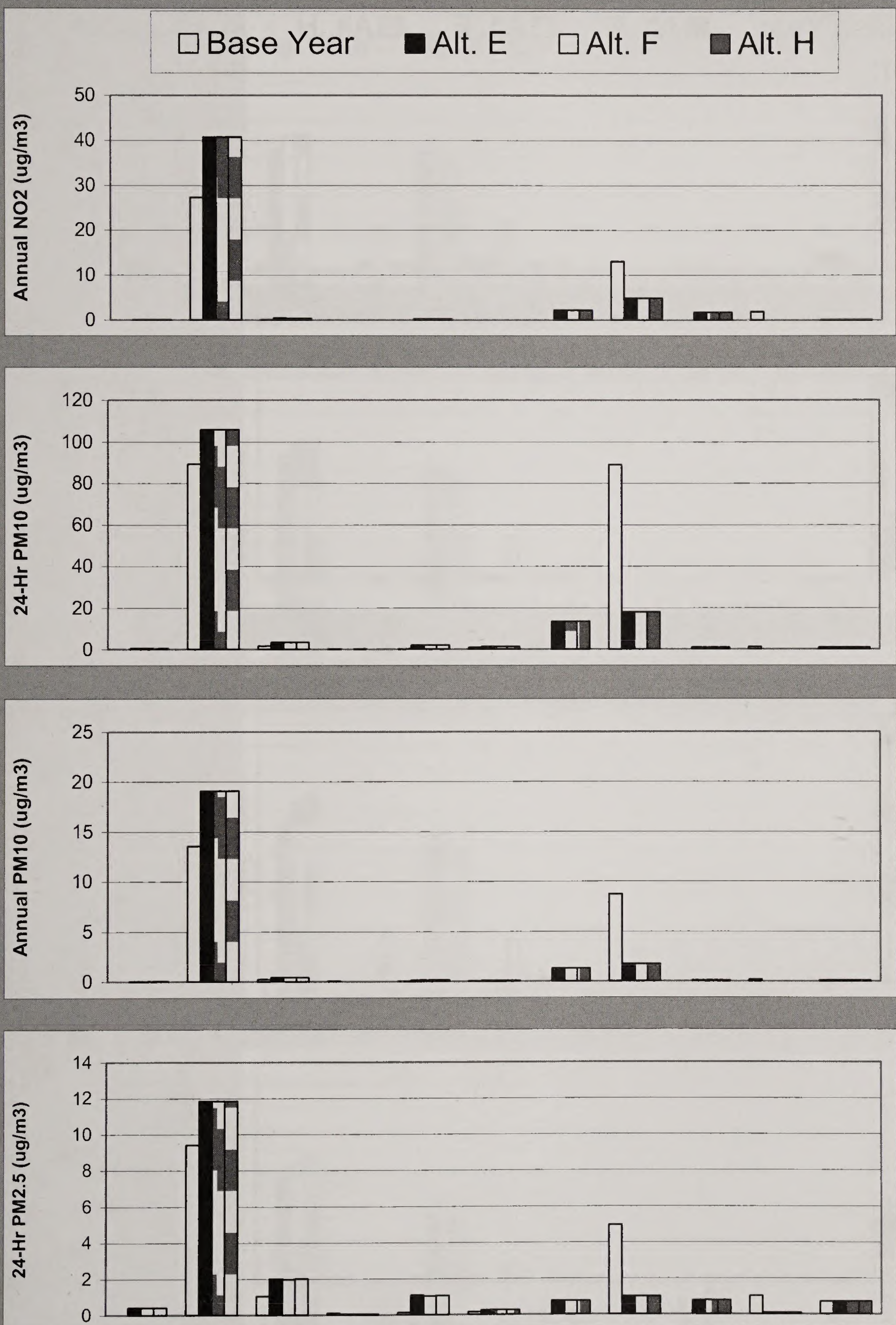


Figure 3-2
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Wyoming Near-field Receptors



Applicable Standards (ug/m3)

NAAQS: 100

NAAQS: 150

NAAQS: 50

NAAQS: 35

Figure 3-2 (continued)
Change in Modeled Concentrations of NO2, SO2, PM10, PM2.5
Wyoming Near-field Receptors

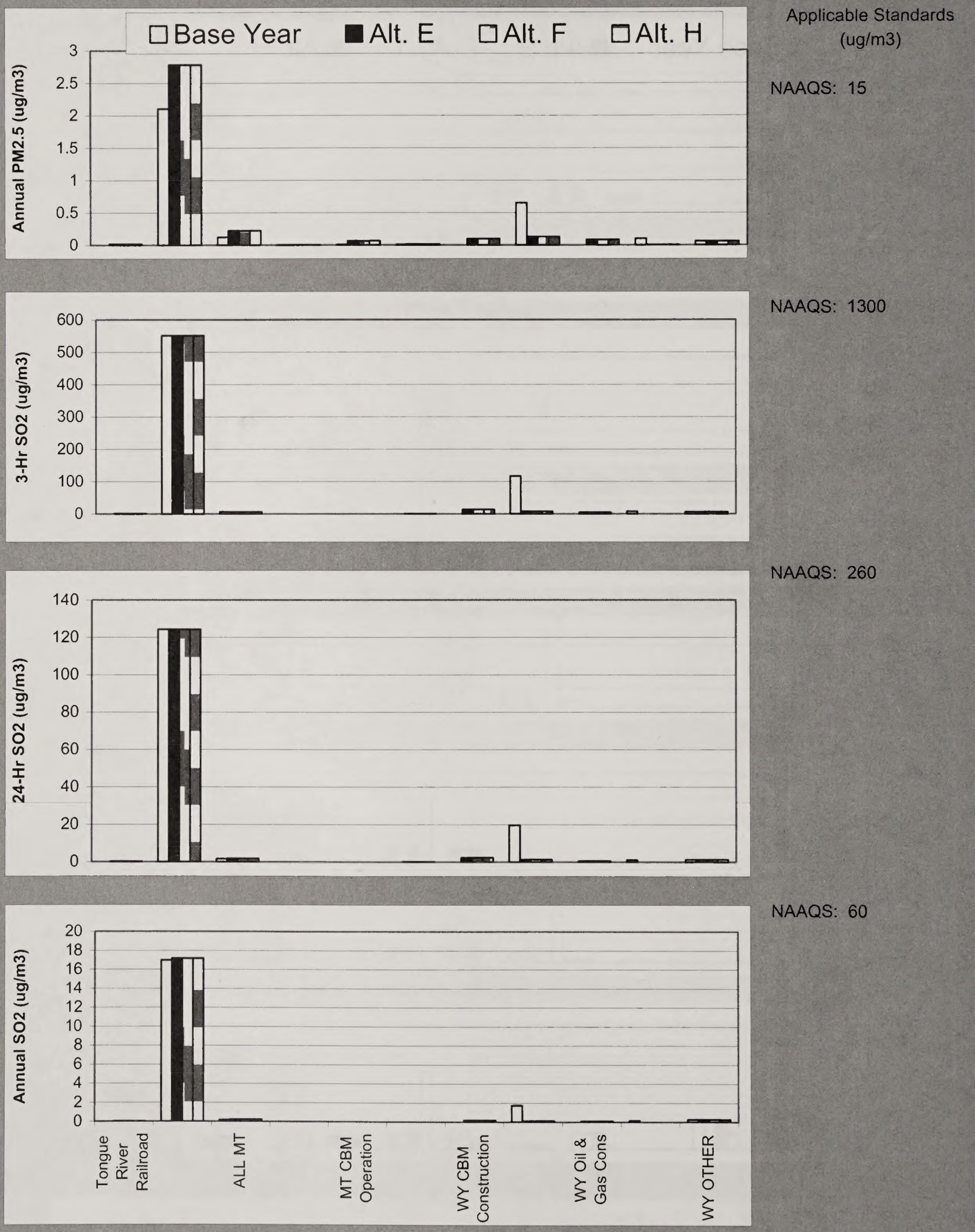


Figure 3-3
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Northern Cheyenne Indian Reservation

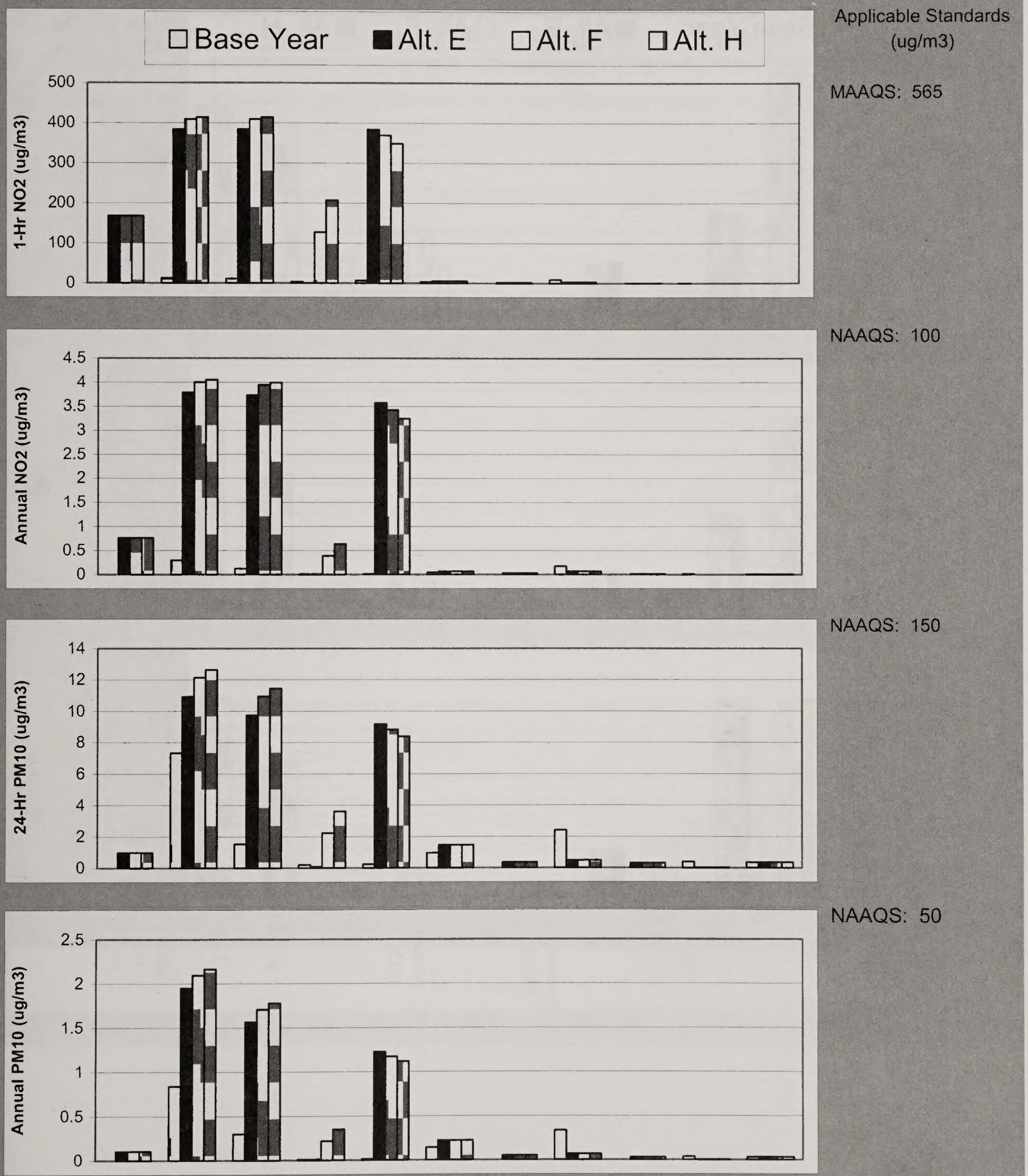
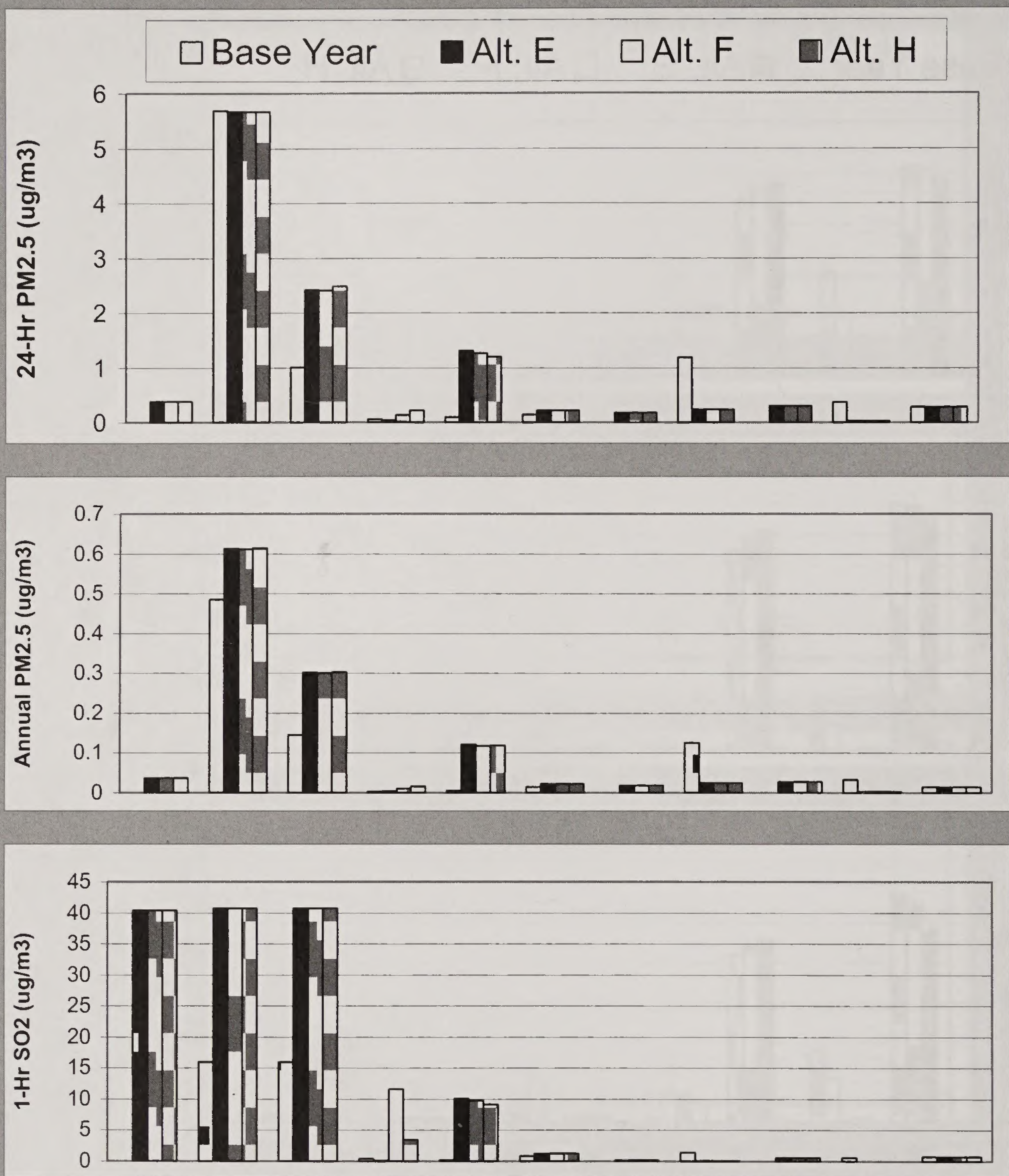


Figure 3-3 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Northern Cheyenne Indian Reservation



Applicable Standards (ug/m3)

NAAQS: 35

NAAQS: 15

NAAQS: 1300

Figure 3-3 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Northern Cheyenne Indian Reservation

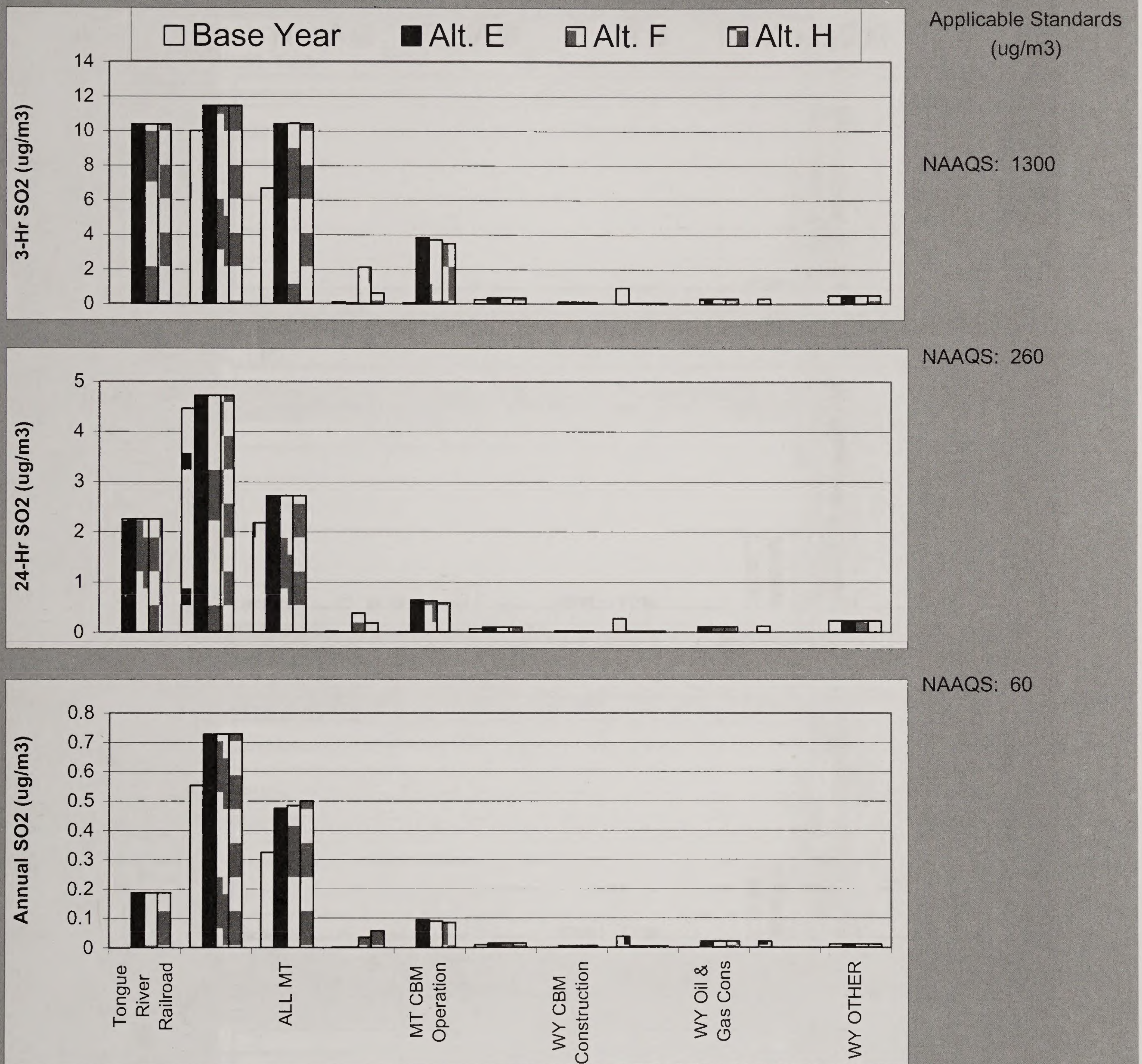


Figure 3-4
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Theodore Roosevelt National Park

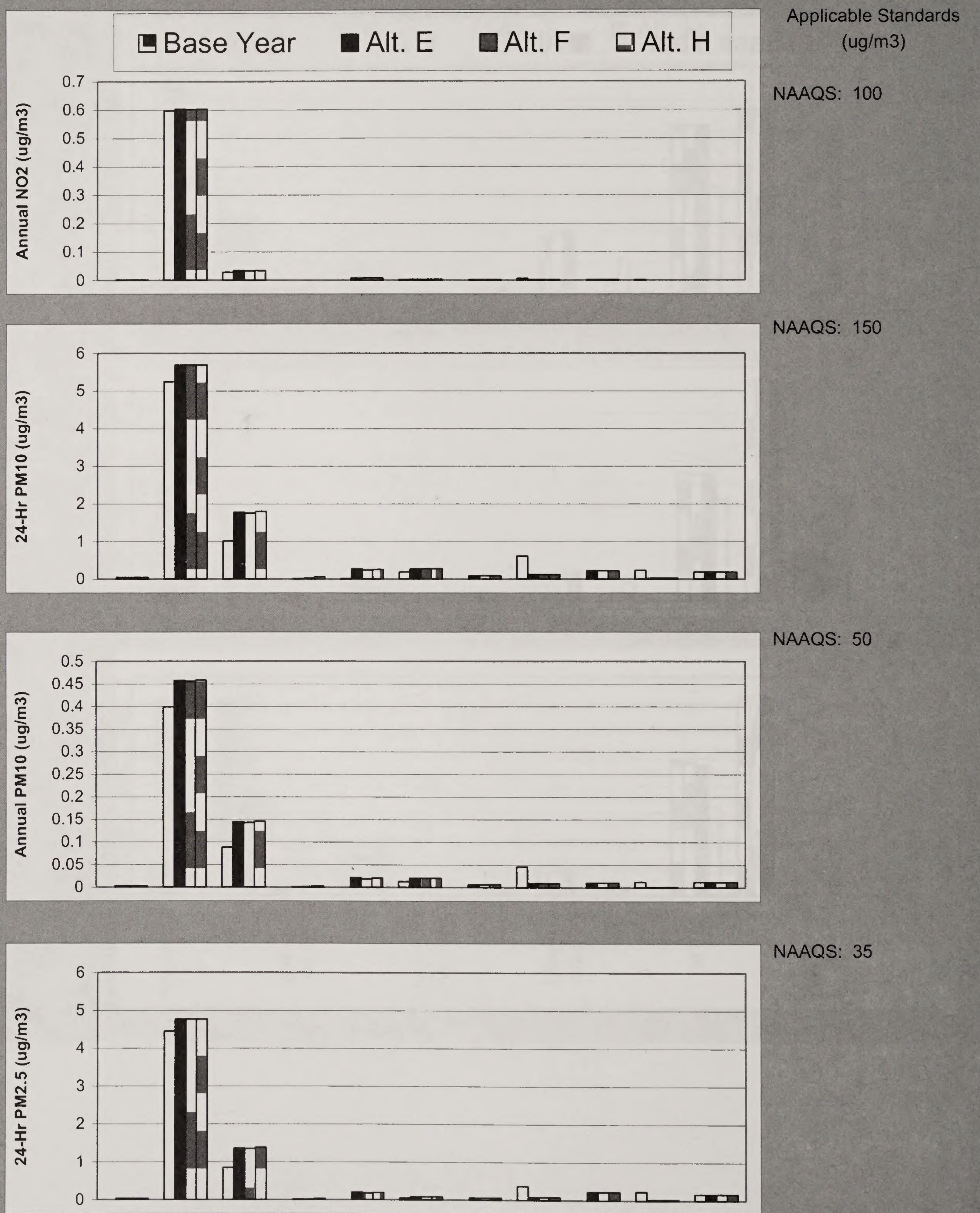


Figure 3-4 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Theodore Roosevelt National Park

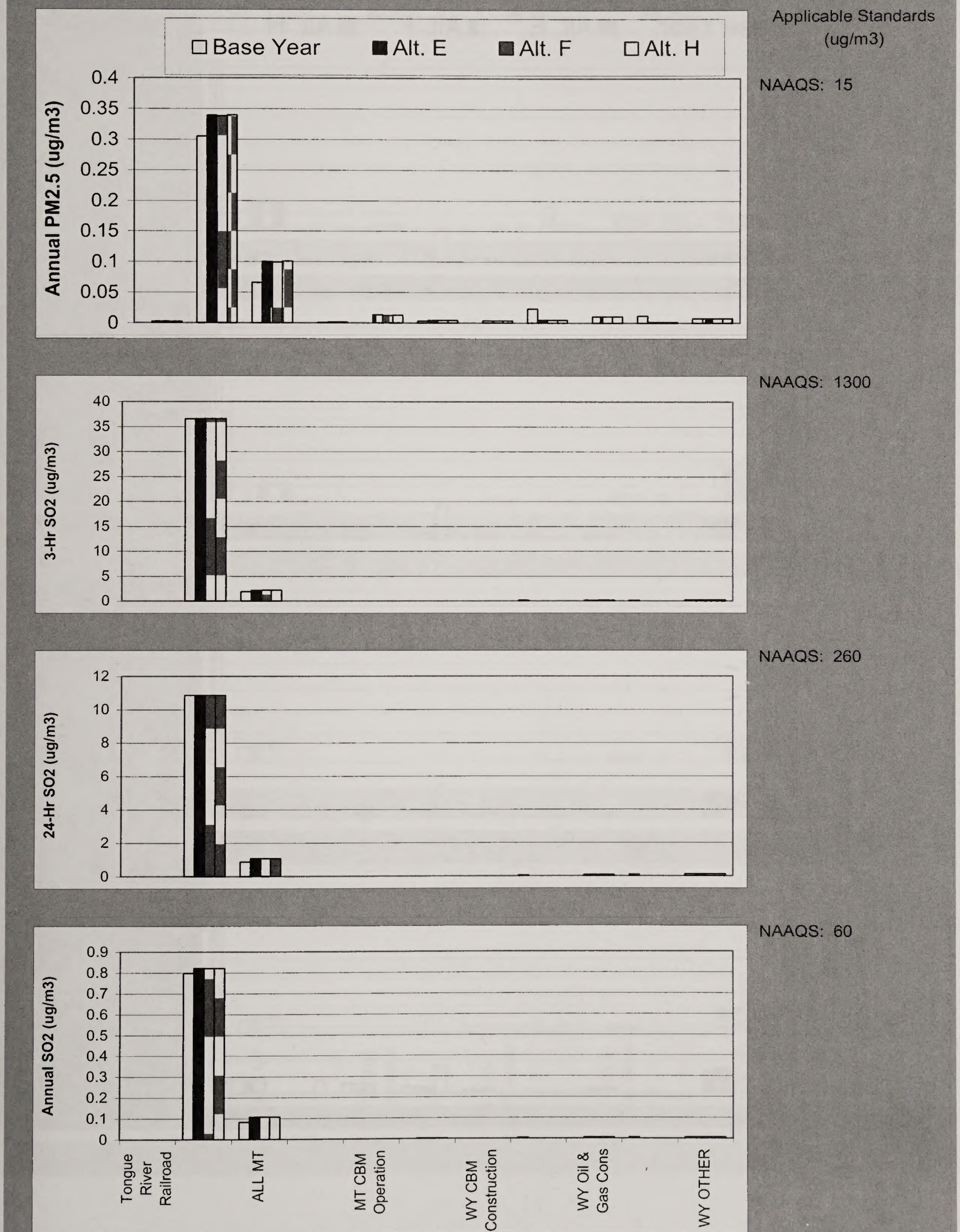


Figure 3-5
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Wind Cave National Park

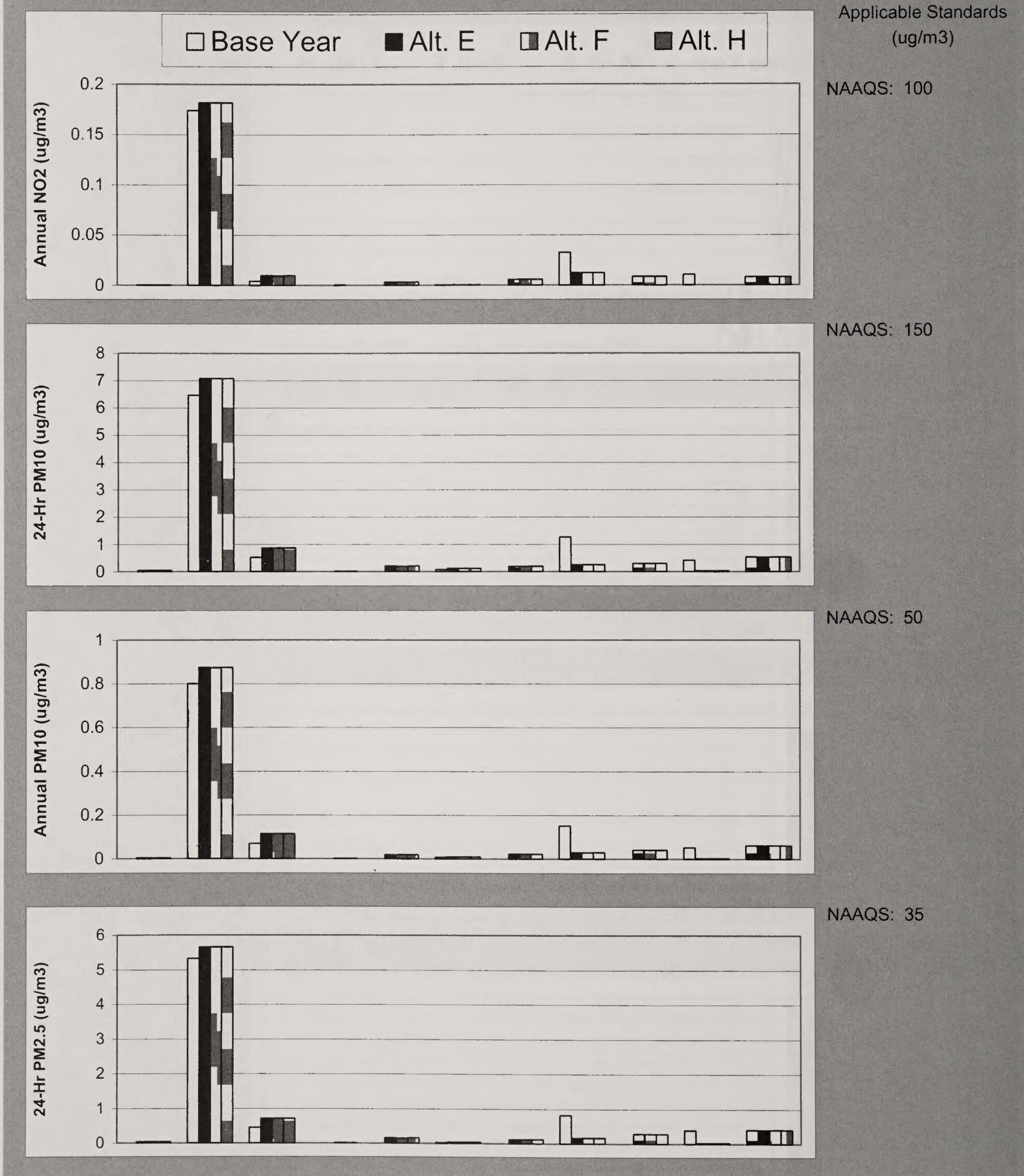


Figure 3-5 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Wind Cave National Park

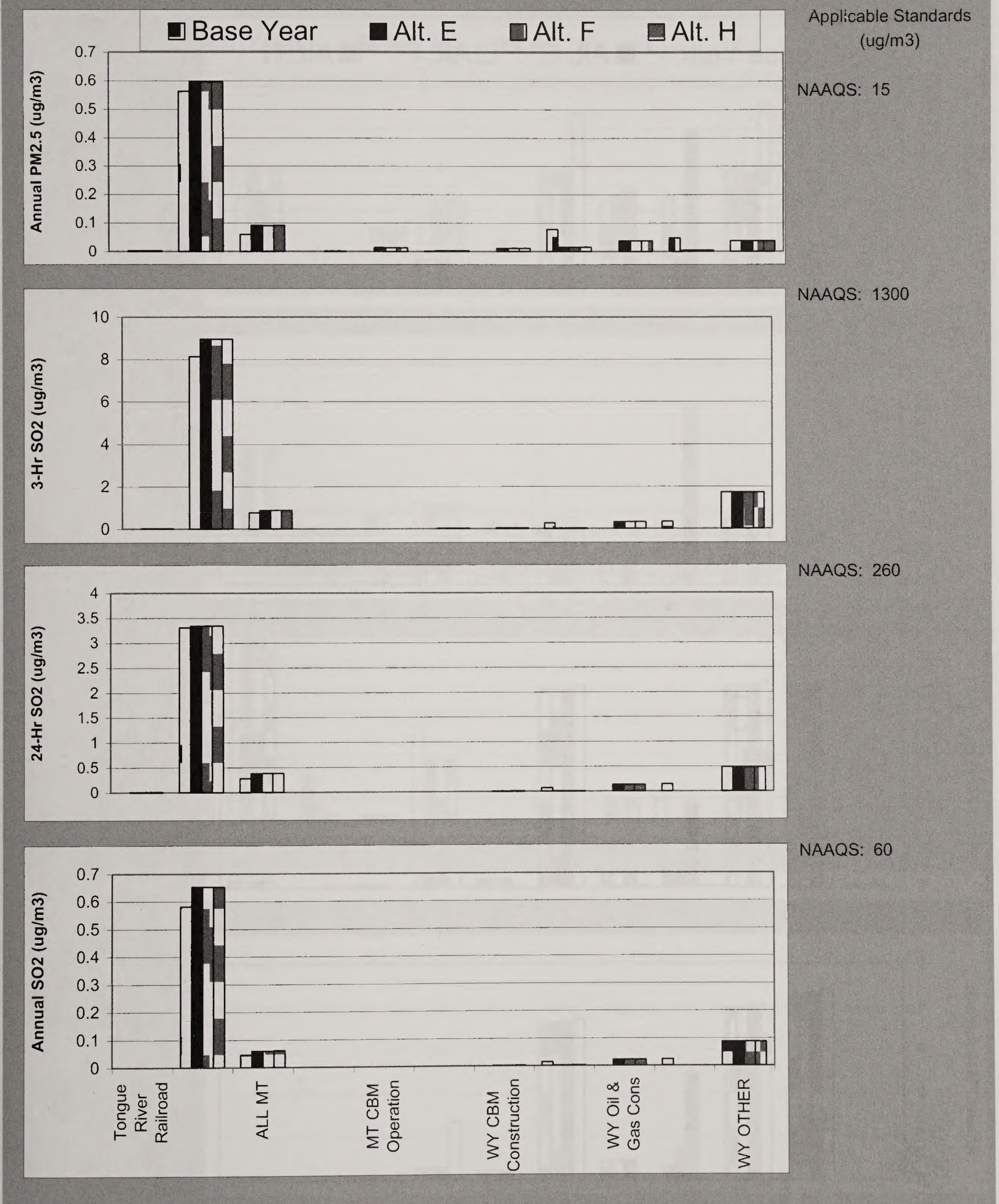


Figure 3-6
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Crow Indian Reservation

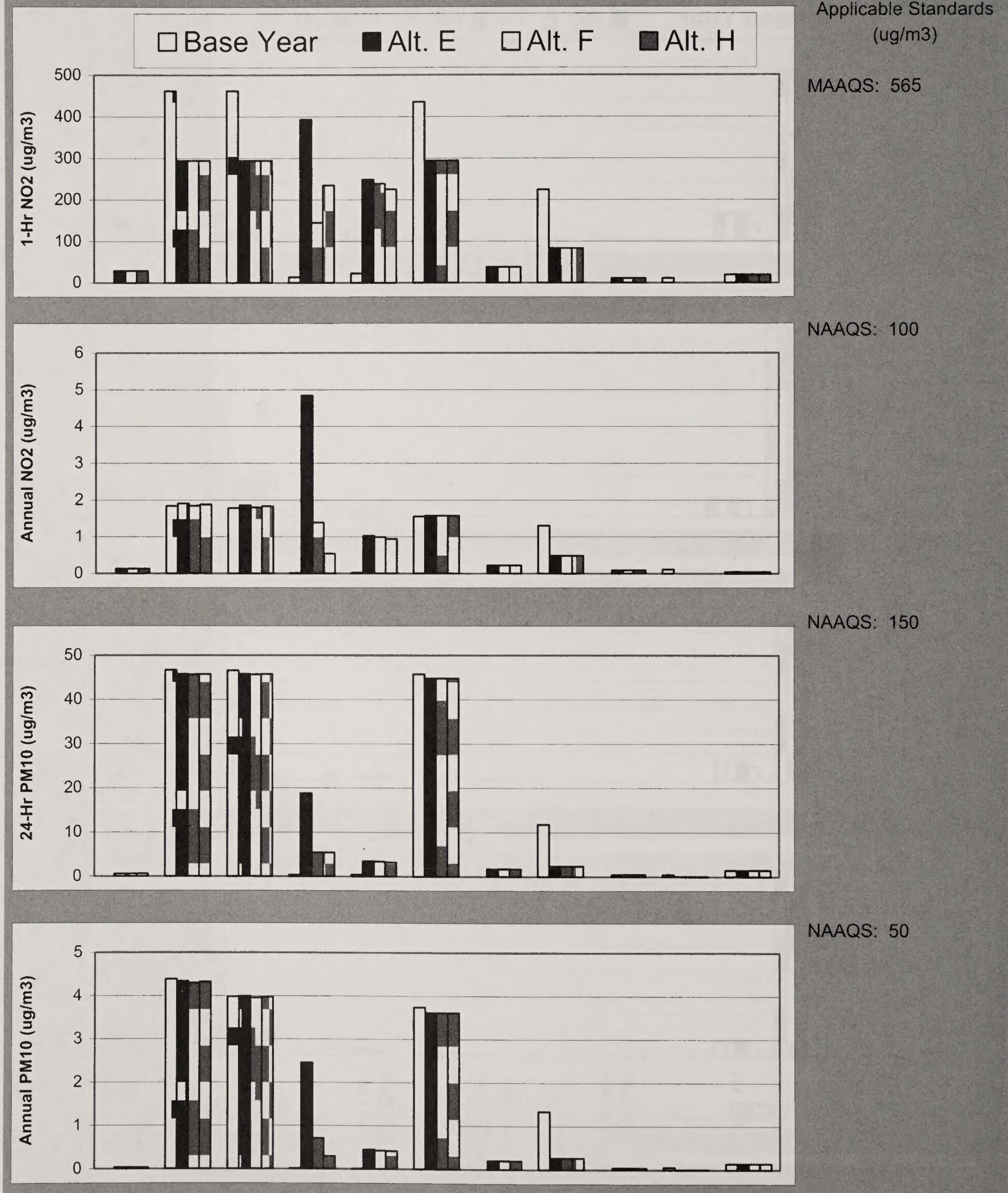


Figure 3-6 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Crow Indian Reservation

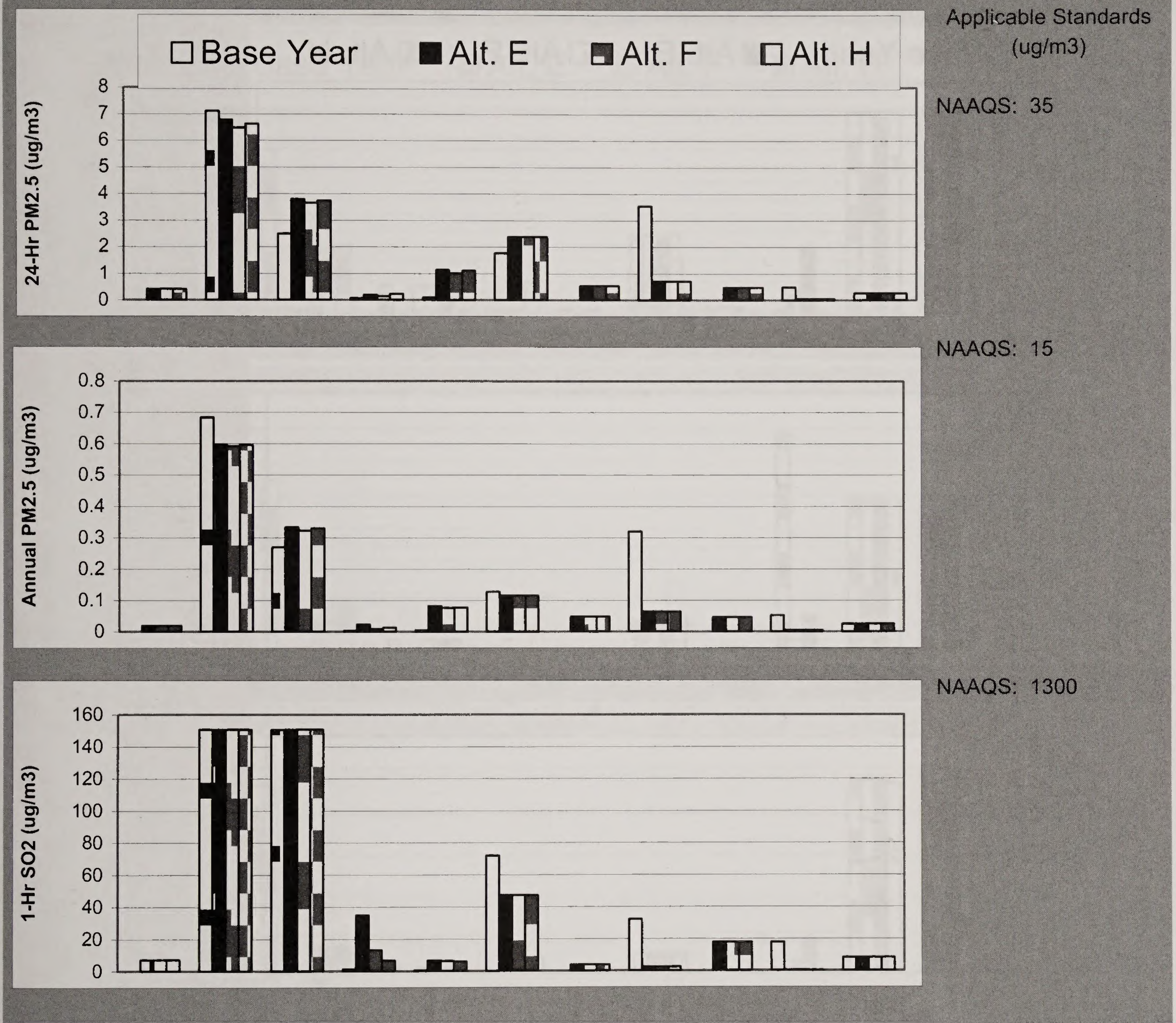


Figure 3-6 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Crow Indian Reservation

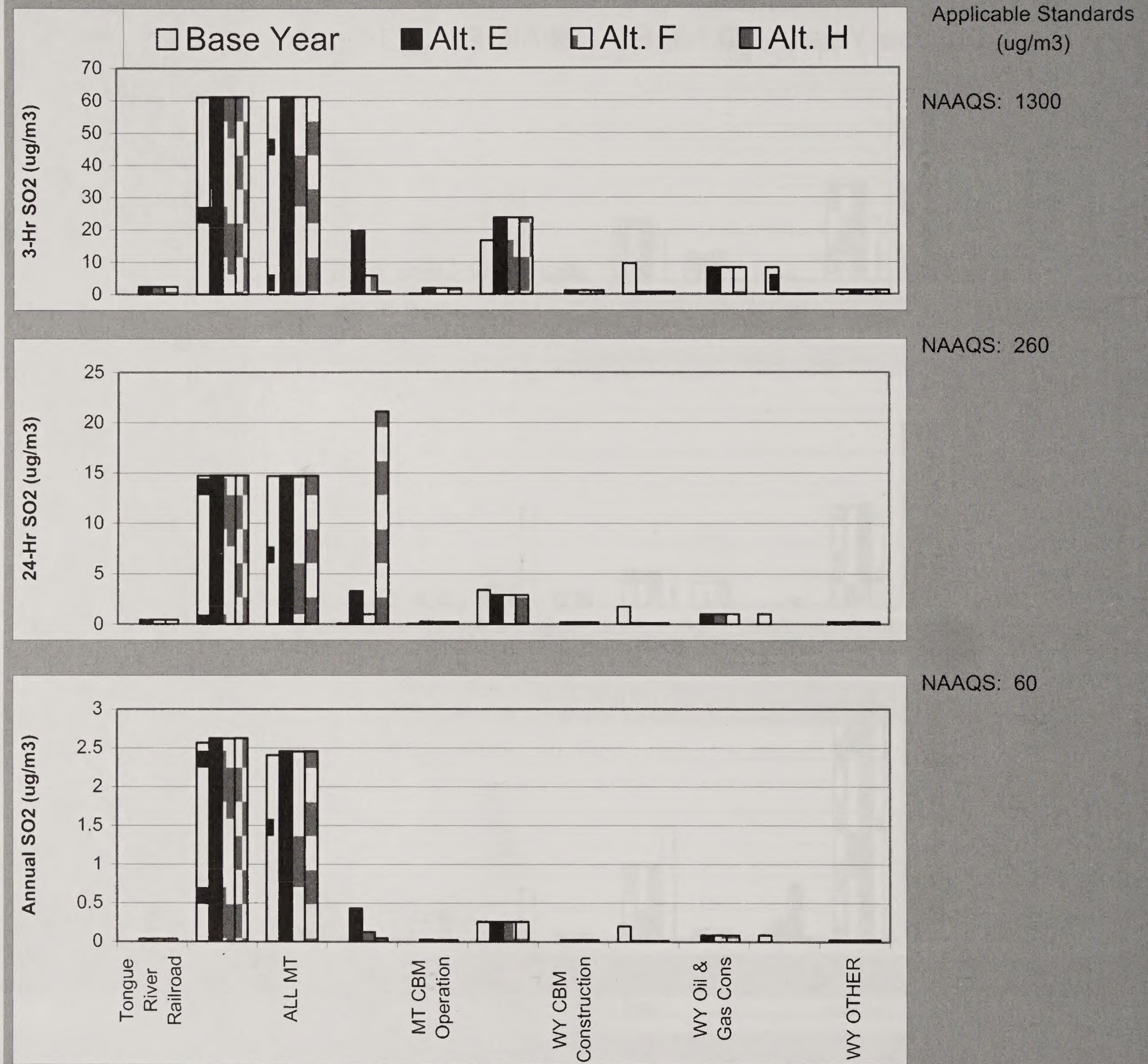


Figure 3-7
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Cloud Peak Wilderness

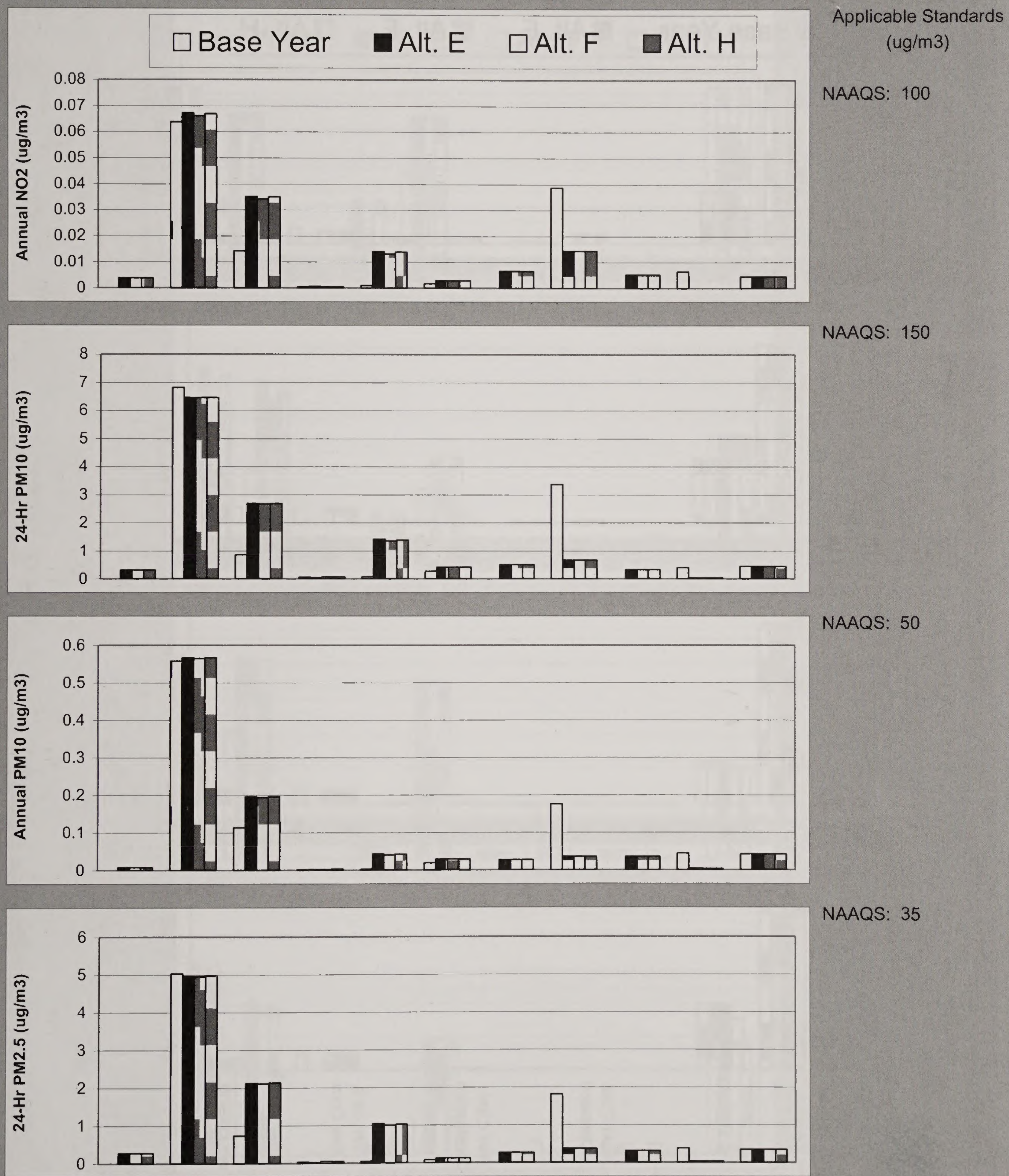


Figure 3-7 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Cloud Peak Wilderness

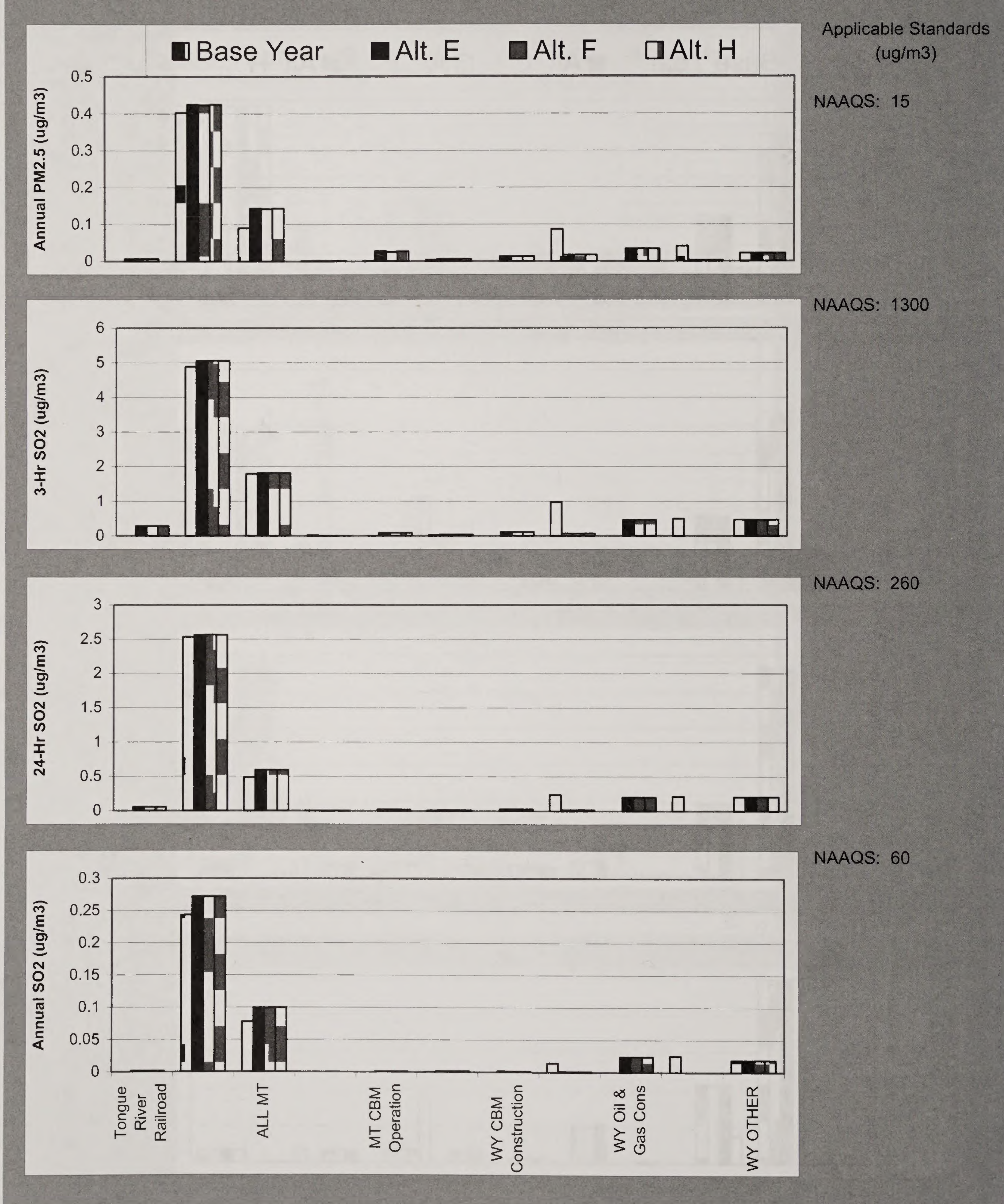


Figure 3-8
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Bighorn Canyon NRA

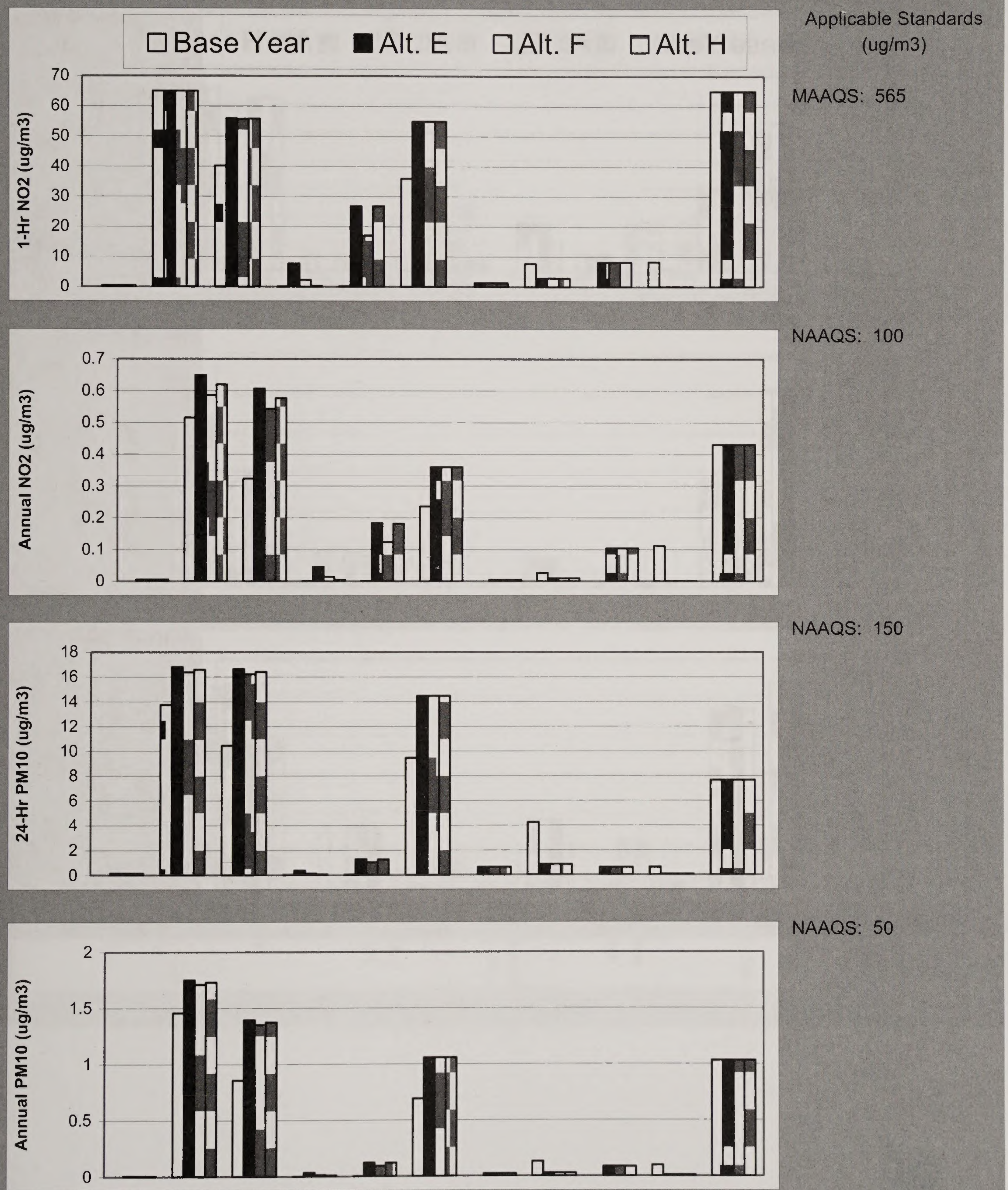
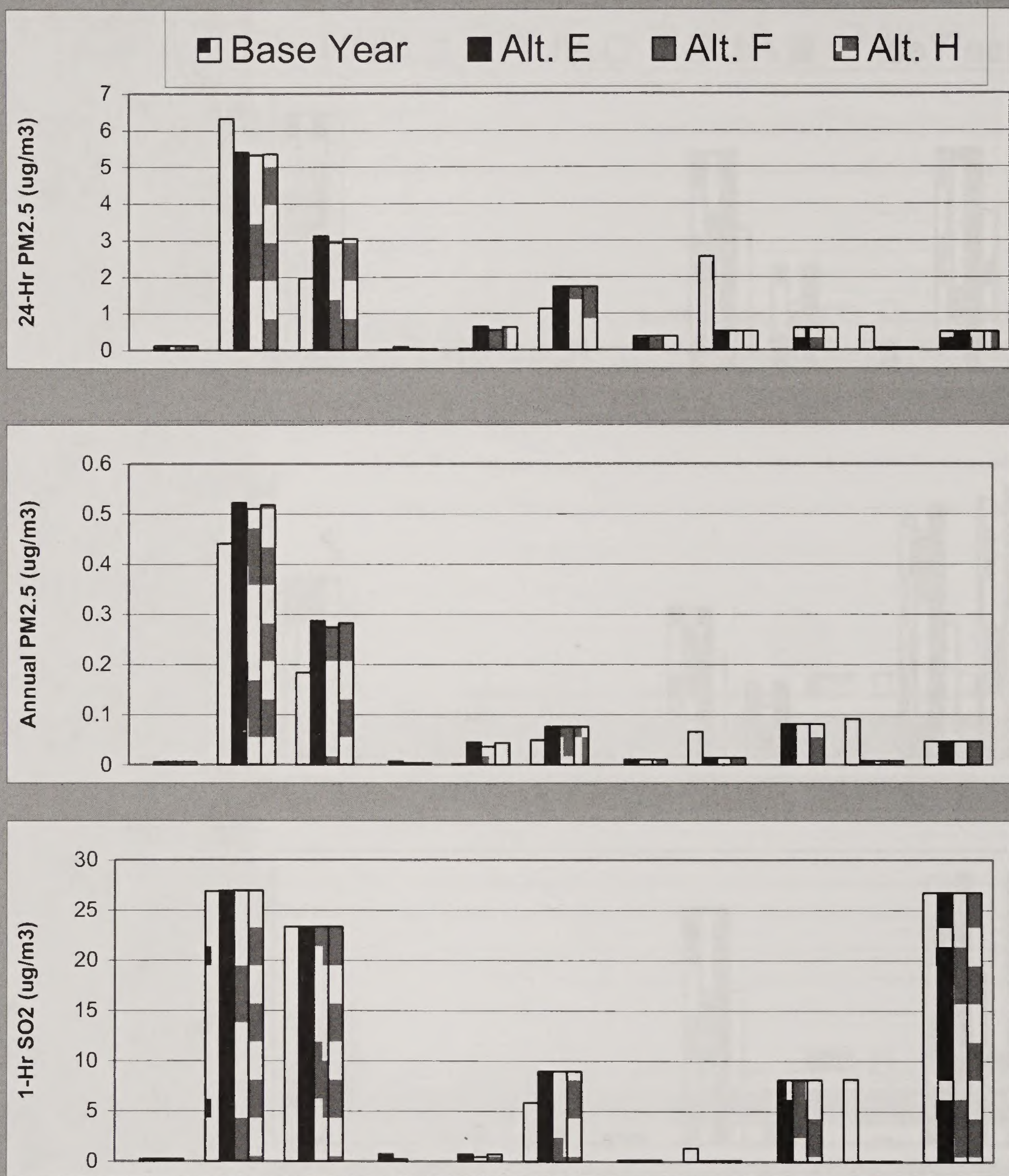


Figure 3-8 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Bighorn Canyon NRA



Applicable Standards (ug/m3)

NAAQS: 35

NAAQS: 15

NAAQS: 1300

Figure 3-8 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Bighorn Canyon NRA

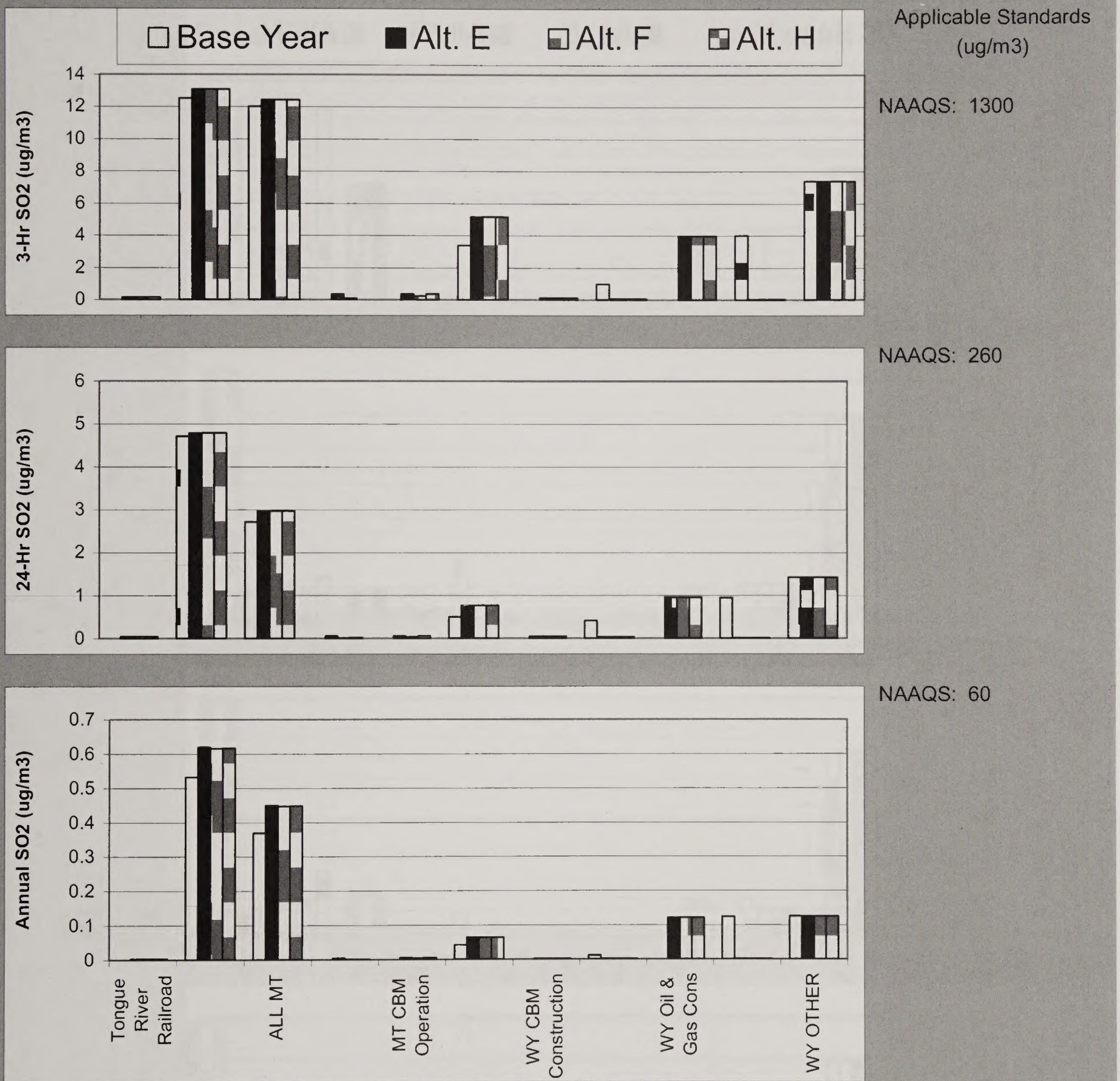


Figure 3-9
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Wind River Indian Reservation

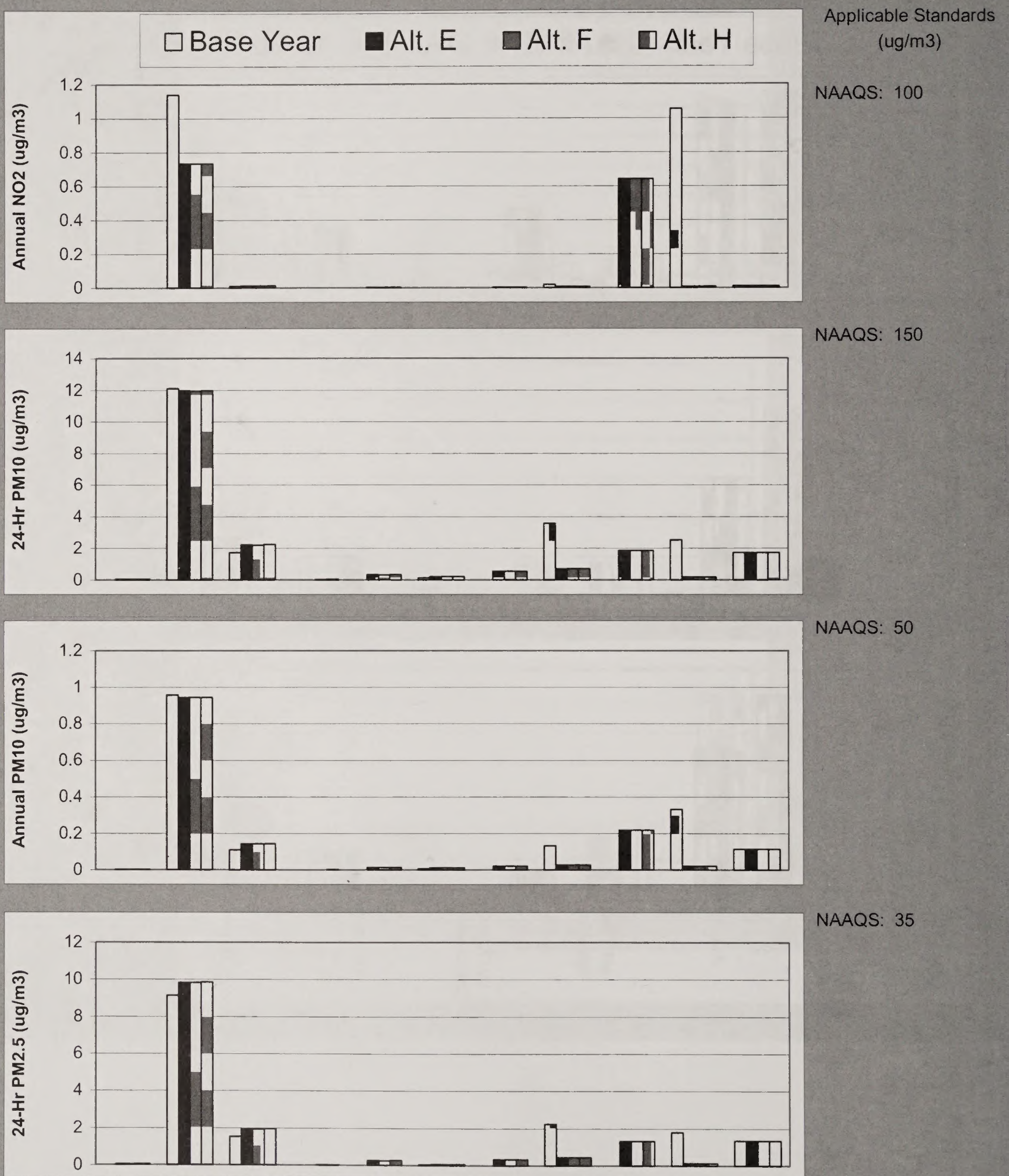
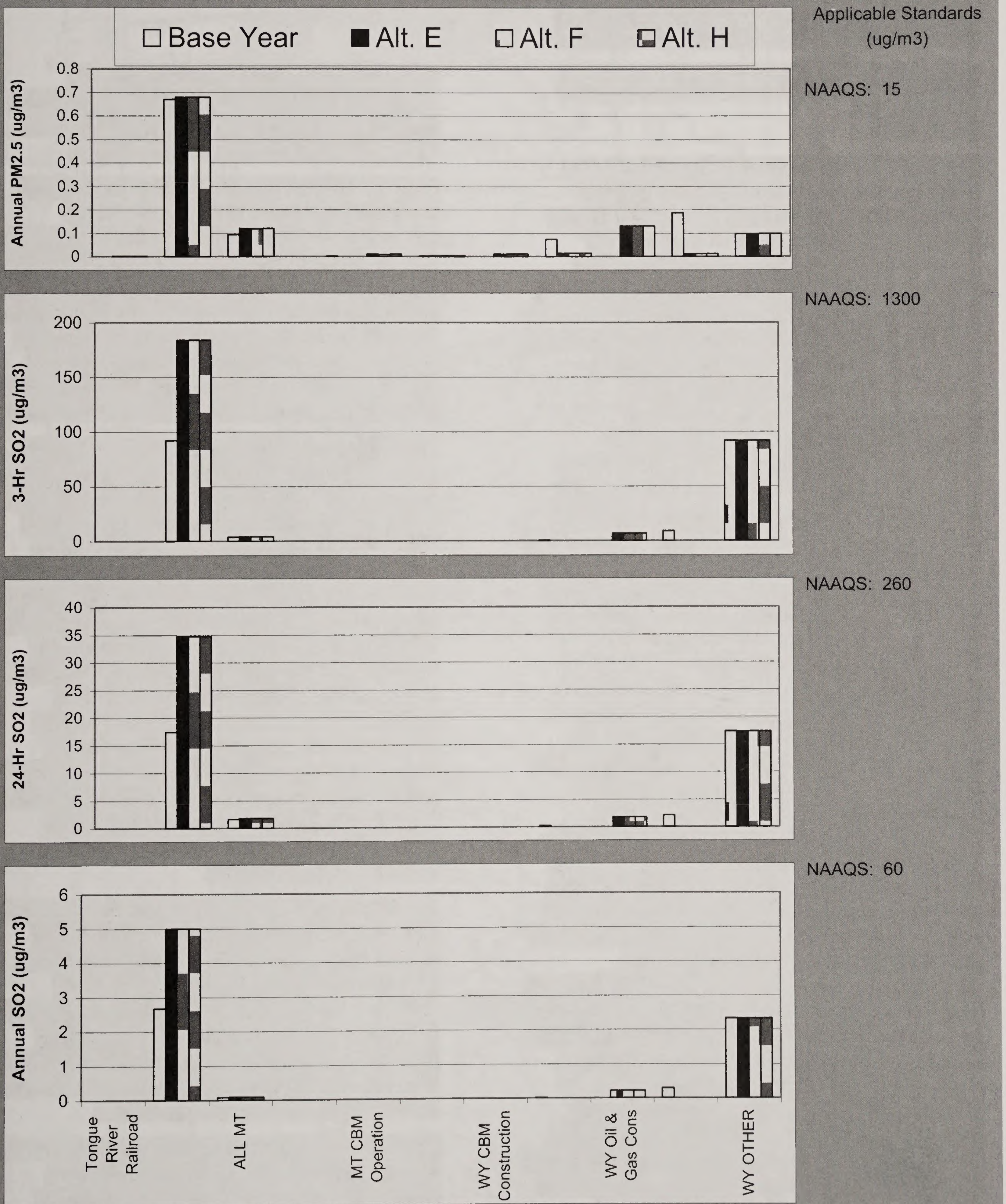


Figure 3-9 (continued)
Change in Modeled Concentrations of NO_2, SO_2, PM_{10}, $PM_{2.5}$
Wind River Indian Reservation



4.0 SUPPLEMENTAL AIR QUALITY ANALYSIS (SAQA) MITIGATION SCENARIOS

Overview of SAQA Assessment Approach

The Supplemental Air Quality Analysis (SAQA) supplements the Air Quality Technical Support Document (AQTSD) (ALL revised 2007) that was prepared in support of the Draft Supplemental Environmental Impact Statement (DSEIS). The *DSEIS* evaluated potential emissions from Coal Bed Natural Gas (CBNG) related activities by combining project related CBNG development, as outlined in the Reasonably Foreseeable Development (RFD) scenario, with non-project related CBNG development on the Crow and Northern Cheyenne Reservations, as outlined in the Reasonably Foreseeable Future Actions (RFFA) scenario, into one emissions source group. The *SAQA* evaluates these two emissions groups separately to allow for the determination of potential air quality impacts that result directly from project related CBNG activities. Also included are potential air quality impacts from emission sources in Montana (All Montana Source Group), which includes project related CNBG emissions, and cumulative emissions (All Source Group) which includes all emissions sources both project related and non-project related. Information on the potential air quality impacts from specific source groups is contained within Appendix C of the SAQA document. Additionally, emission points representing potential emissions from CBNG construction, operations, and maintenance activities were decentralized within each watershed to better represent actual development conditions (locations shown on Figure 4-1). The adjustments to emission point locations and the separation of RFD and RFFA CBNG wells were applied to each of the supplemental scenarios analyzed which are described below. Emission factors used were derived from the air quality modeling analyses conducted for the 2003 Final Environmental Impact Statement (FEIS) conducted by Argonne National Laboratories (Argonne 2002). The air modeling analysis was conducted to separate project RFD emissions from non-project RFFA emissions; decentralize the project RFD and non-project RFFA emission source points; and utilize a well to field compressor to sales compressor ratio of 240 wells connected to 10 field compressors connected to 1 sales compressor (240:10:1) with a NO_X emissions factor for compressors of 1.5 grams per brake horsepower-hour (1.5 g/bhp-hr). This scenario is referred to in the *SAQA* document as Alternative H Revised.

Current CBNG development within the Montana portion of the Powder River Basin (PRB) is conducted using a ratio of 200 wells connected to 5 field compressors connected to 1 sales compressor. The *SAQA* includes an air modeling analysis scenario which uses this ratio of 200:5:1 and a NO_X emissions factor for compressors of 1.5 g/bhp-hr for project RFD wells; the well to field compressor to sales compressor ratio for non-project RFFA wells was not adjusted. This scenario is referred to as Scenario 1.

The *SAQA* also evaluates an air modeling analysis scenario (Scenario 2) using the 200:5:1 well to field compressor to sales compressor ratio and the NO_X emissions factor of 1.0 g/bhp-hr for project RFD wells; the NO_X emissions factor for non-project RFFA wells was not adjusted. The 1.0 g/bhp-hr NOx emission factor was selected for Scenario 2 to reflect the emission level currently being permitted by the Montana Department of Environmental Quality (MDEQ) for CBNG compressors within the PRB. Scenarios 1 and 2 utilize the same number of operating CBNG wells but would have varying compressor and horsepower requirements and subsequent emissions output related to compressor operations. The lowering of the NO_X emissions factor to reflect current MDEQ permitting levels for Scenario 2 would further reduce the emissions associated with Scenario 1.

The *SAQA* evaluates a mitigation scenario (Scenario 1A) which assumes a 50% reduction applied to Scenario 1 compressor horsepower requirements. This scenario reduces compressor operations emissions and associated maintenance emissions by 50% but leaves all other emissions the same as previously modeled for Scenario 1. The effect of this assumption reduces calculated compressor emissions by 50% for NO_X, SO_2, PM_{10}, and $PM_{2.5}$.

The *SAQA* evaluates a second air quality mitigation scenario (Scenario 2A) which assumes a 50% reduction applied to the Scenario 2 compressor

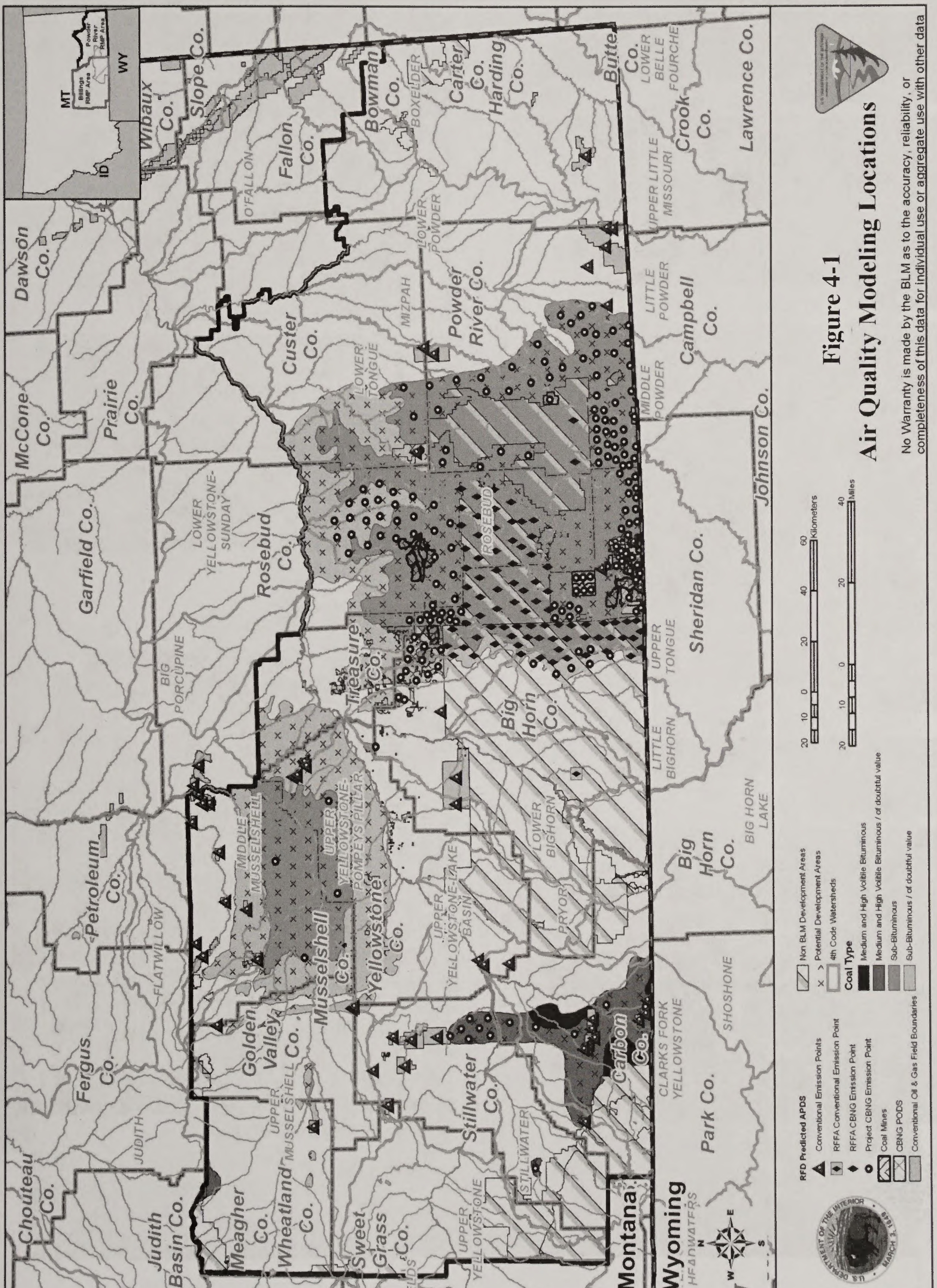


Figure 4-1

Air Quality Modeling Locations

No Warranty is made by the BLM as to the accuracy, reliability, or completeness of this data for individual use or aggregate use with other data

horsepower requirements. This scenario reduces compressor operations emissions and associated maintenance emissions by 50% but leaves all other emissions the same as previously modeled for Scenario 2. The effect of this assumption reduces calculated compressor emissions by 50% for NO_X, SO_2, PM_{10}, and $PM_{2.5}$.

The *SAQA* also includes revised emissions data for the Tongue River Railroad (TRR) which was reconfigured to better simulate a linear emission source. The total emissions for the TRR were kept constant and are the same as presented in the *AQTSD*; however, the number of emission points representing the TRR alignment was increased from 20 to 96.

Project related emissions include emissions from CBNG construction and operations activities in Montana. The scenarios presented within the *SAQA* were analyzed to assess project related versus non-project related CBNG emissions under Revised Alternative H, assess emissions associated with compressor operations utilizing different NO_X emissions factors and adjusting well to field to sales compressor ratios to more accurately represents current practice within the Montana portion of the PRB under Scenarios 1 and 2, and assess at what level project related CBNG emissions would need to be reduced to achieve zero days of impacts to visibility at the Prevention of Significant Deterioration (PSD) Class I areas under Scenarios 1A and 2A.

Results of SAQA Mitigation Assessment

For each of the five CBNG development scenarios, the projected impacts on air quality were determined for each receptor group. The analyses for the key receptor groups are provided in Table 4-1 for the Montana near-field receptor grid, in Table 4-2 for the Northern Cheyenne Indian Reservation, and in Table 4-3 for the Crow Indian Reservation. The project CBNG impacts for construction and operation activities have been combined in Tables 4-1, 4-2, and 4-3 to provide a conservative estimate of total project impacts. In actuality, the impacts from different source groups are not arithmetically additive, as maximum impacts may occur at different receptors and/or at different times. Changes from these scenarios at other receptors were generally very minor or not detectable, but are provided in Appendix C in the SAQA document.

Direct Project Impacts (RFD)

This section describes the CALPUFF model predicted direct project impacts for reasonably foreseeable development of CBNG within the project planning area. Only impacts directly attributed to project CBNG construction and operations are discussed in this section. Comprehensive details of modeled emission impacts are provided in Appendix C.

This section also provides discussion of potential project related CBNG impacts as they pertain to Potential for Significant Deterioration (PSD) increment thresholds within the Class I and Class II areas located in the model domain. All National Environmental Policy Act (NEPA) analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD increment consumption analysis.

Alt. H Revised

Under the Alternative H Revised modeling, potential direct project CBNG impacts for both operation and construction activities are below applicable standards for NO_2, SO_2, PM_{10} and $PM_{2.5}$ at the Montana Near-Field receptor grid. Similar results are seen at the Northern Cheyenne Indian Reservation and the Crow Indian Reservation. The predicted project CBNG operation impacts at the Crow Indian Reservation indicate a 1-hour NO_2 ambient concentration of 425 micrograms per cubic meter ($\mu g/m^3$) in comparison with a NAAQS standard of 565 $\mu g/m^3$. Combined project CBNG construction and operation impacts shown in Tables 4-1 through 4-3 as "Project CBNG" indicate that Class I PSD increment levels for at the Northern Cheyenne Indian Reservation and Class II PSD increment levels at the Montana near-field and Crow Indian Reservation receptors would not be exceeded. Combined project CBNG impacts would not exceed the MAAQS as well.

Table 4-1 Potential Modeled Concentrations of NO_2, PM_{10}, $PM_{2.5}$ and SO_2 for Montana Near-Field Grid

Pollutant	Avg. Time	Project CBNG Impact Alt H Revised (µg/m³)	Project CBNG Impact Scenario 1 (µg/m³)	Project CBNG Impact Scenario 1A (µg/m³)	Project CBNG Impact Scenario 2 (µg/m³)	Project CBNG Impact Scenario 2A (µg/m³)	Project CBNG Sources Montana Base Year (µg/m³)	MT Back-ground Values (µg/m³)	PSD[1] Increment Class II (µg/m³)	NAAQS /[2] MAAQS (µg/m³)
NO2	Annual	2.41	1.93	1.09	1.39	0.81	1	6	25	100
	1-Hour	354	284	158	203	118	322	75	n/a	565
SO2	Annual	0.03	0.03	0.03	0.03	0.03	0	3	20	60
	24-Hour	0.21	0.21	0.19	0.21	0.19	0	11	91	260
	3-Hour	1.21	1.22	1.08	1.22	1.08	4	26	512	1,300
	1-Hour	4.09	4.12	3.65	4.12	3.65	16	35	n/a	1,300
PM10	Annual	0.64	0.61	0.40	0.59	0.39	0	8	17	50
	24-Hour	4.33	4.03	2.58	3.75	2.44	6	30	30	150
PM2.5	Annual	0.30	0.26	0.16	0.24	0.14	0	3.4	n/a	15
	24-Hour	2.18	1.86	1.11	1.60	0.98	1	17.2	n/a	35
Pollutant	**Avg. Time**	**ALL Sources Impact Alt H Revised (µg/m³)**	**ALL Sources Impact Scenario 1 (µg/m³)**	**ALL Sources Impact Scenario 1A (µg/m³)**	**ALL Sources Impact Scenario 2 (µg/m³)**	**ALL Sources Impact Scenario 2A (µg/m³)**	**ALL Sources Montana Base Year (µg/m³)**	**MT Back-ground Values (µg/m³)**	**PSD[1] Increment Class II (µg/m³)**	**NAAQS /[2] MAAQS (µg/m³)**
NO2	Annual	3.5	3.32	3.00	3.11	2.90	3.91	6	25	100
	1-Hour	540	540	539	540	539	428	75	n/a	565
SO2	Annual	1.79	1.79	1.79	1.79	1.79	1.71	3	20	60
	24-Hour	15.1	15.1	15.1	15.1	15.1	15.1	11	91	260
	3-Hour	43.9	43.9	43.9	43.9	43.9	43.9	26	512	1,300
	1-Hour	140	140	140	140	140	140	35	n/a	1,300
PM10	Annual	2.88	2.88	2.87	2.87	2.86	3.52	8	17	50
	24-Hour	46.9	46.9	46.8	46.8	46.8	30.6	30	30	150
PM2.5	Annual	0.89	0.85	0.78	0.83	0.77	0.88	3.4	n/a	15
	24-Hour	7.01	6.95	6.77	6.90	6.72	6.83	17.2	n/a	35

[1]PSD Increment is to be compared directly to the modeled impact
[2]Background should be added to modeled impact for comparison to AAQS
n/a – not applicable

Table 4-2 Potential Modeled Concentrations of NO_2, PM_{10}, $PM_{2.5}$ and SO_2 for Northern Cheyenne Indian Reservation

Pollutant	Avg. Time	Project CBNG Impact Alt H Revised (µg/m³)	Project CBNG Impact Scenario 1 (µg/m³)	Project CBNG Impact Scenario 1A (µg/m³)	Project CBNG Impact Scenario 2 (µg/m³)	Project CBNG Impact Scenario 2A (µg/m³)	Project CBNG Sources Montana Base Year (µg/m³)	MT Back-ground Values (µg/m³)	PSD[1] Increment Class I (µg/m³)	NAAQS /[2] MAAQS (µg/m³)
NO2	Annual	0.65	0.52	0.29	0.37	0.22	0.03	6	2.5	100
	1-Hour	125	100	56	71.7	42	10.4	75	n/a	565
SO2	Annual	0.01	0.01	0.01	0.01	0.01	0	3	2	60
	24-Hour	0.07	0.08	0.07	0.08	0.07	0.03	11	5	260
	3-Hour	0.49	0.50	0.44	0.50	0.44	0.18	26	25	1,300
	1-Hour	1.50	1.52	1.34	1.52	1.34	0.6	35	n/a	1,300
PM10	Annual	0.20	0.19	0.12	0.18	0.12	0.02	8	4	50
	24-Hour	1.55	1.48	0.95	1.42	0.92	0.43	30	8	150
PM2.5	Annual	0.10	0.09	0.05	0.08	0.05	0	3.4	n/a	15
	24-Hour	0.76	0.64	0.38	0.57	0.34	0.16	17.2	n/a	35
Pollutant	**Avg. Time**	**ALL Sources Impact Alt H Revised (µg/m³)**	**ALL Sources Impact Scenario 1 (µg/m³)**	**ALL Sources Impact Scenario 1A (µg/m³)**	**ALL Sources Impact Scenario 2 (µg/m³)**	**ALL Sources Impact Scenario 2A (µg/m³)**	**ALL Sources Montana Base Year (µg/m³)**	**MT Back-ground Values (µg/m³)**	**PSD[1] Increment Class I (µg/m³)**	**NAAQS /[2] MAAQS (µg/m³)**
NO2	Annual	2.27	2.15	1.84	2.0	1.85	0.30	6	2.5	100
	1-Hour	428	428	428	428	428	13.1	75	n/a	565
SO2	Annual	0.72	0.72	0.72	0.72	0.72	0.55	3	2	60
	24-Hour	4.70	4.70	4.70	4.70	4.70	4.46	11	5	260
	3-Hour	10.5	10.5	10.5	10.5	10.5	10.0	26	25	1,300
	1-Hour	30.7	30.7	30.7	30.7	30.7	160	35	n/a	1,300
PM10	Annual	1.32	1.31	1.24	1.30	1.23	0.84	8	4	50
	24-Hour	8.46	8.40	8.25	8.34	8.22	7.33	30	8	150
PM2.5	Annual	0.72	0.70	0.67	0.69	0.66	0.48	3.4	n/a	15
	24-Hour	6.02	5.97	5.85	5.92	5.82	5.69	17.2	n/a	35

[1]PSD Increment is to be compared directly to the modeled impact

[2]Background should be added to modeled impact for comparison to AAQS

n/a – not applicable

Table 4-3 Potential Modeled Concentrations of NO_2, PM_{10}, $PM_{2.5}$ and SO_2 for Crow Indian Reservation

Pollutant	Avg. Time	Project CBNG Impact Alt H Revised (µg/m³)	Project CBNG Impact Scenario 1 (µg/m³)	Project CBNG Impact Scenario 1A (µg/m³)	Project CBNG Impact Scenario 2 (µg/m³)	Project CBNG Impact Scenario 2A (µg/m³)	Project CBNG Sources Montana Base Year (µg/m³)	MT Background Values (µg/m³)	PSD[1] Increment Class II (µg/m³)	NAAQS /[2] MAAQS (µg/m³)
NO2	Annual	1.18	0.94	0.53	0.67	0.39	0.03	6	25	100
	1-Hour	469	376	210	269	157	36.5	75	n/a	565
SO2	Annual	0.02	0.02	0.01	0.02	0.01	0	3	20	60
	24-Hour	0.17	0.17	0.15	0.17	0.15	0.06	11	91	260
	3-Hour	1.28	1.29	1.14	1.29	1.14	0.43	26	512	1,300
	1-Hour	5.42	5.46	4.84	5.46	4.84	1.94	35	n/a	1,300
PM10	Annual	0.33	0.31	0.20	0.29	0.19	0.02	8	17	50
	24-Hour	3.52	3.39	2.19	3.30	2.14	0.74	30	30	150
PM2.5	Annual	0.16	0.14	0.08	0.12	0.07	0	3.4	n/a	15
	24-Hour	1.49	1.29	0.79	1.29	0.75	0.16	17.2	n/a	35
Pollutant	Avg. Time	ALL Sources Impact Alt H Revised (µg/m³)	ALL Sources Impact Scenario 1 (µg/m³)	ALL Sources Impact Scenario 1A (µg/m³)	ALL Sources Impact Scenario 2 (µg/m³)	ALL Sources Impact Scenario 2A (µg/m³)	ALL Sources Montana Base Year (µg/m³)	MT Background Values (µg/m³)	PSD[1] Increment Class II (µg/m³)	NAAQS /[2] MAAQS (µg/m³)
NO2	Annual	2.78	2.63	2.36	2.46	2.27	1.83	6	25	100
	1-Hour	469	376	322	322	322	461.7	75	n/a	565
SO2	Annual	2.62	2.62	2.62	2.62	2.62	2.57	3	20	60
	24-Hour	14.7	14.7	14.7	14.7	14.7	14.7	11	91	260
	3-Hour	61.2	61.2	61.2	61.2	61.2	61.1	26	512	1,300
	1-Hour	151	151	151	151	151	150.6	35	n/a	1,300
PM10	Annual	4.29	4.28	4.27	4.28	4.27	4.38	8	17	50
	24-Hour	45.6	45.6	45.6	45.6	45.6	46.7	30	30	150
PM2.5	Annual	0.83	0.81	0.77	0.798	0.76	0.68	3.4	n/a	15
	24-Hour	6.59	6.51	6.38	6.47	6.38	7.11	17.2	n/a	35

[1]PSD Increment is to be compared directly to the modeled impact

[2]Background should be added to modeled impact for comparison to AAQS

n/a – not applicable

Scenario 1

Potential direct project CBNG impacts for both operation and construction activities are below applicable standards for NO_2, SO_2, PM_{10} and $PM_{2.5}$ at the Montana Near-Field, Northern Cheyenne Indian Reservation, and Crow Indian Reservation receptor grids under Scenario 1. Impacts for SO_2 would be unchanged from the Alternative H Revised Scenario at the Montana Near-Field and Crow Indian Reservation receptors, and only slightly increased at the Northern Cheyenne Indian Reservation receptors. Combined project CBNG impacts shown in Tables 4-1 through 4-3 as "Project CBNG" are decreased from the Alternative H Revised Scenario, and are still below both Class I and Class II PSD increment levels at all receptors.

Scenario 1A

Scenario 1A potential impacts are less than the impacts described in the Alternative H Revised Scenario, Scenario 1, and Scenario 2 for SO_2, but are the same as the SO_2 impacts predicted by Scenario 2A. Similar results are seen with other modeled pollutants, with the exception that impacts are slightly higher than those predicted by Scenario 2A. Combined project CBNG impacts shown in Tables 4-1 through 4-3 as "Project CBNG" are decreased from the Alternative H Revised Scenario, Scenario 1, and Scenario 2. Combined project CBNG impacts are still below both Class I and Class II PSD increment levels at all receptors.

Scenario 2

The model predicted potential impacts under Scenario 2 are less than those of Scenario 1, with direct project CBNG construction and operation impacts well below any applicable standard for NO_2, SO_2, PM_{10} and $PM_{2.5}$ at the Montana Near-Field receptor grid and on the Northern Cheyenne Indian Reservation and the Crow Indian Reservation. The predicted impacts at the Crow Indian Reservation indicate a decrease in the 1-hour NO_2 ambient concentration from the project CBNG operation source to 225 $\mu g/m^3$. Combined project CBNG impacts shown in Tables 4-1 through 4-3 as "Project CBNG" are still below both Class I and Class II PSD increment levels at all receptors.

Scenario 2A

As would be anticipated with a 50 percent reduction in Scenario 2 emissions from the CBNG field and sales compressor operation and maintenance emissions, potential direct impacts at the Montana Near-Field receptor grid and on the Northern Cheyenne Indian Reservation and the Crow Indian Reservation are further reduced from Scenario 2. The predicted impacts at the Crow Indian Reservation indicate a further reduction in the 1-hour NO_2 ambient concentration to 113 $\mu g/m^3$. Combined project CBNG impacts shown in Tables 4-1 through 4-3 as "Project CBNG" are still below both Class I and Class II PSD increment levels at all receptors.

Potential Visibility Impacts

Table 4-4 shows the impacts at the Northern Cheyenne Indian Reservation and the Crow Indian Reservation for the base year, and each of the modeled Alternative H scenarios. Results are provided separately for the Montana project CBNG construction and operation, as well as combined Montana project CBNG construction and operation with RFFA sources as the All Montana and All Sources source groups. Comprehensive details of the modeling results are given in Appendix C of the SAQA document. The key impacts under the Method 2 approach are summarized in Table 4-4. Visibility impacts for each of the scenarios for the Northern Cheyenne Indian Reservation and Crow Indian Reservation under Method 6 are summarized in Table 4-5.

Method Two

Potential impacts at Northern Cheyenne Indian Reservation from project CBNG construction are reduced slightly from the Alternative H Revised Scenario through Scenario 2A. For this construction source group there are no days with impacts greater than 10% of the background at either the Northern Cheyenne Indian Reservation or the Crow Indian Reservation. For project CBNG operation there are 35 days per year with impacts above 10% at the Northern Cheyenne Indian Reservation for Scenario 1, but the number of days drops to 2 per year for Scenario 2A. The number of days with impacts above 10% at the Crow Indian Reservation drops from 87 days per year for Scenario 1 to 11 days per year under.

Table 4-4 Potential Visibility Impacts – Method 2 - Summary

Receptor Set	Project CBNG Construction			Project CBNG Operation			ALL MT			ALL SOURCES		
	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}
	5%	10%		5%	10%		5%	10%		5%	10%	
Northern Cheyenne Indian Reservation Class I												
Base Year	3	1	10	7	1	15	209	113	90	298	235	416
Revised Alternative H	2	0	6.0	129	55	51.1	357	279	186.0	363	314	467.7
Scenario 1	2	0	6.0	108	35	40.1	357	276	177.6	363	314	461.6
Scenario 1A	1	0	5.0	35	7	20.1	353	269	170.3	363	310	450.8
Scenario 2	2	0	6.0	67	17	27.7	354	273	173.0	363	312	454.8
Scenario 2A	1	0	5.0	17	2	13.9	353	264	168.0	363	308	447.4
Crow Indian Reservation Class II												
Base Year	3	0	8.3	8	2	12.1	365	350	710	365	358	714
Revised Alternative H	17	0	8.3	195	107	71.0	365	365	>1,000	365	365	>1,000
Scenario 1	17	0	8.3	169	87	55.6	365	365	>1,000	365	365	>1,000
Scenario 1A	7	0	6.7	87	29	28	365	365	>1,000	365	365	>1,000
Scenario 2	17	0	8.3	141	60	38.1	365	365	>1,000	365	365	>1,000
Scenario 2A	7	0	6.7	60	11	19.1	365	365	>1,000	365	365	>1,000

Table 4-5 Potential Visibility Impacts – Method 6 and Monthly f(RH) values - Scenarios

Receptor Set	Project CBNG Construction				Project CBNG Operation				ALL MT				ALL SOURCES			
	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}	Number of Days>N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}
	5%	10%			5%	10%			5%	10%			5%	10%		
Northern Cheyenne Indian Reservation Class I																
Base Year	1	0	5.0	2.2	2	0	9.5	3.1	192	97	79	33	299	234	312	121
Revised Alternative H	1	0	5.0	2.6	97	24	21.9	17.1	356	271	140.7	68.5	364	316	339.2	156.1
Scenario 1	1	0	5.0	2.6	64	19	18.6	13.9	356	268	139.1	65.7	364	314	337.89	154.4
Scenario 1A	1	0	5.0	2.6	20	0	9.3	7.0	355	261	136.1	61.2	364	311	335.4	151.5
Scenario 2	1	0	5.0	2.6	37	7	15.2	9.9	355	264	137.3	62.6	364	312	336.40	152.6
Scenario 2A	1	0	5.0	2.6	7	0	7.6	4.9	354	257	135.2	60.8	364	310	334.68	150.5
Crow Indian Reservation Class II																
Base Year	1	0	5.2	2.6	5	0	7.2	3.4	365	352	659	430	365	360	664	441
Revised Alternative H	7	0	6.7	4.9	173	82	36.7	27.7	365	365	999.5	651.9	365	365	>1,000	666.9
Scenario 1	7	0	6.7	4.9	146	61	29.2	22.0	365	365	999.5	651.3	365	365	>1,000	664.8
Scenario 1A	7	0	6.7	4.9	61	11	14.6	11.0	365	365	999.5	650.3	365	365	>1,000	663.2
Scenario 2	7	0	6.7	4.9	118	38	21.1	16.6	365	365	999.5	650.7	365	365	>1,000	663.6
Scenario 2A	7	0	6.7	4.9	38	3	10.6	8.3	365	365	999.5	649.9	365	365	>1,000	662.8

Acid Deposition Impacts

The acid deposition rates for nitrogen and sulfur compounds from project CBNG operation and construction are below established thresholds which are 3 kilograms per hectare per year (kg/ha-year) for nitrogen compounds and 5 kg/ha-year for sulfur compounds (Fox, et. Al. 1989). Complete results are provided in Appendix C of the SAQA document, with the base year summary in Table 4-4 of the SAQA document. A careful examination of those results shows that there are no exceedances of applicable regulatory thresholds for any of the modeled scenarios.

Cumulative Impacts (Existing Sources + RFD + RFFA Sources)

The cumulative impacts analysis discussion which follows describes the combined effects of project CBNG development sources with reasonably foreseeable future action sources and existing sources which may contribute to potential air quality impacts within the project planning area (Additional detail on potential modeled emissions is provided within the tables in Appendix C of the SAQA document). Model results indicate the potential for impact to the Class II PSD increment for 24-hour PM_{10} on the Crow Indian Reservation. The Montana Near-Field shows a potential to exceed the Class II PSD increment for 24-hour PM_{10} and the 1-hour NO_2 ambient air quality standard. There is also a potential to exceed the Class I PSD increment for 24-hour PM_{10} at the Northern Cheyenne Indian Reservation. Cumulative impacts to the key receptors from the All Montana source group and the All Sources source group are very similar between all modeled scenarios. This indicates that there is most likely a dominant emission source in the RFFA which affects the impacts at a given receptor.

Alt. H Revised

The cumulative impacts under the Alternative H Revised scenario for the Montana Near-Field receptor grid indicate that there are no exceedances of air quality standards predicted (Additional detail on potential modeled emissions is provided within the tables in Appendix C of the SAQA document). The 1-hour NO_2 ambient concentration for the All Montana source group is 539 $\mu g/m^3$ and for the All Sources source group is 540 $\mu g/m^3$. Thus, while the standard is not exceeded, the model predicts that there is a potential for impact to this standard. Cumulative impacts at the Northern Cheyenne Indian Reservation are all predicted to be below any applicable air quality standards. On the Crow Indian Reservation cumulative impacts to the 1-hour NO_2 standard is not predicted to be exceeded in the All Montana and All Source group categories. The 1-hour NO_2 is 469 $\mu g/m^3$ for both of these source groups in comparison with a standard of 565 $\mu g/m^3$. The Base Year impacts for the All Montana and All Sources source groups for 1-hour NO_2 is 461.7 $\mu g/m^3$ indicating an increase of 7.3 $\mu g/m^3$, and the 24-hour PM_{10} is 45.6 $\mu g/m^3$ for both source groups indicating an decrease of 1 $\mu g/m^3$ from the Base Year for the All Sources source group and the All Montana source group. While the direct modeled impacts for the All Montana and All Sources source groups are above the Class II PSD increment, the model indicates a reduction in 24-hour PM_{10} from the Base Year and is below the PSD increment of 30 $\mu g/m^3$ for Class II areas. All other impacts are below any applicable air quality standard.

Scenario 1

Cumulative impacts under Scenario 1 for the Montana near field receptor grid indicate that there are no exceedances of air quality standards predicted (Additional detail on potential modeled emissions is provided within the tables in Appendix C of the SAQA document). The 1-hour NO_2 ambient concentration for the All Montana source group is 539 $\mu g/m^3$ and for the All Sources source group is 540 $\mu g/m^3$. While the standard is not exceeded, the model predicts that there is a potential for impact to this standard. At the Northern Cheyenne Indian Reservation cumulative impacts are all predicted to be below any applicable air quality standards. All impacts on the Crow Indian Reservation are predicted to be below any applicable air quality standard.

Scenario 1A

There is a small difference between Scenario 1A and Scenario 1 cumulative impacts at the Montana near field receptor grid. The 1-hour NO_2 ambient concentration for the All Montana source group and All Sources source group is

539 μg/m^3. Cumulative impacts to the Northern Cheyenne Indian Reservation are all predicted to be below any applicable air quality standards. All impacts on the Crow Indian Reservation are predicted to be below any applicable air quality standard.

Scenario 2

There is no difference between Scenario 2 and Scenario 1 cumulative impacts at the Montana near field receptor grid. This indicates that there is most likely a dominant emission source in the RFFA source emissions or other existing emission sources (such as the Colstrip power plants and coal mine) which affects the impacts at a specific receptor. Cumulative impacts to the Northern Cheyenne Indian Reservation are all predicted to be below any applicable air quality standards. The same results for cumulative impacts on the Crow Indian Reservation are predicted under Scenario 2 as in Scenario 1. All impacts are below any applicable air quality standard.

Scenario 2A

There is a small difference between Scenario 2A and Scenario 2 cumulative impacts at the Montana near field receptor grid. The 1-hour NO2 ambient concentration for the All Montana source group and All Sources source group is 539 μg/m^3. Cumulative impacts to the Northern Cheyenne Indian Reservation are all predicted to be below any applicable air quality standards. The same results for cumulative impacts on the Crow Indian Reservation are predicted under Scenario 2 as in Scenario 1. All impacts are below any applicable air quality standard.

Tongue River Railroad

The results from the revised modeling effort shown in Table 4-6 indicate that the reductions in emissions and the reconfiguration of the Tongue River Railroad sources led to reductions in visibility impacts at nearby sensitive Class I and Class II areas, and no notable reductions in impacts at the more distant sensitive area receptors.

In the original configuration, the Tongue River Railroad emissions led to measurable impacts on the Northern Cheyenne Indian Reservation and on the Crow Indian Reservation. Originally, the number of days with impacts above 1.0 deciview was 23 days for the Northern Cheyenne Indian Reservation, 8 days for the Crow Indian Reservation, and 2 days at the Cloud Peak Wilderness area. As a result of modifying the source configuration, those numbers dropped to one day at the Northern Cheyenne and zero days at the Crow Indian Reservation and Cloud Peak Wilderness area. The reconfiguration of the emission source points demonstrates that the Tongue River Railroad by itself does not have the potential to cause any impacts on visibility at any mandatory Class I or Class II areas.

Table 4-6
Visibility Impacts of Original Versus Revised Tongue River Railroad Source

Receptor Set	Original Analysis Tongue River Railroad				Revised Source Configuration Tongue River Railroad			
	Number of Days > N% Change in Bext		Maximum % Change in Bext	8th Highest % Change in Bext	Number of Days > N% Change in B_{ext}		Maximum % Change in B_{ext}	8th Highest % Change in B_{ext}
	5%	10%			5%	10%		
CLASS I AREAS								
Badlands NP Class I	0	0	1	1	0	0	0	0
Bob Marshall W Class I	0	0	0	0	0	0	0	0
Bridger W Class I	0	0	2	1	0	0	0	0
Fitzpatrick W Class I	0	0	2	0	0	0	0	0
Fort Peck IR Class I	0	0	2	1	0	0	0	0
Gates of the Mountain W Class I	0	0	1	0	0	0	0	0
Grand Teton NP Class I	0	0	1	0	0	0	0	0
North Absaroka W Class I	0	0	3	1	0	0	1	0
North Cheyenne IR Class I	71	23	27	14	1	0	7	3
Red Rock Lakes Class I	0	0	1	0	0	0	0	0
Scapegoat W Class I	0	0	1	0	0	0	0	0
Teton W Class I	0	0	1	0	0	0	0	0
Theodore Roosevelt NP Class I	0	0	3	1	0	0	1	0
UL Bend W Class I	0	0	2	1	0	0	0	0
Washakie W Class I	0	0	2	1	0	0	0	0
Wind Cave NP Class I	0	0	2	1	0	0	0	0
Yellowstone NP Class I	0	0	3	0	0	0	1	0
SENSITIVE CLASS II AREAS								
Absaroka Beartooth W Class II	1	0	6	1	0	0	1	0
Agate Fossil Beds NM Class II	0	0	1	1	0	0	0	0
Big Horn Canyon NRA Class II	3	0	7	3	0	0	1	1
Black Elk W Class II	0	0	2	1	0	0	0	0
Cloud Peak Class II	4	2	24	3	0	0	5	1
Crow IR Class II	27	8	21	11	0	0	5	2
Devils Tower NM Class II	0	0	2	1	0	0	0	0
Fort Belknap IR Class II	0	0	2	1	0	0	0	0
Fort Laramie NHS Class II	0	0	1	1	0	0	0	0
Jedediah Smith W Class II	0	0	1	0	0	0	0	0
Jewel Cave NM Class II	0	0	2	1	0	0	0	0
Lee Metcalf W Class II	0	0	2	0	0	0	0	0
Mt Naomi W Class II	0	0	1	0	0	0	0	0
Mt Rushmore Class II	0	0	2	1	0	0	0	0
Popo Agie W Class II	0	0	2	1	0	0	0	0
Soldier Creek WA Class II	0	0	1	1	0	0	0	0
Wellsville Mountain W Class II	0	0	0	0	0	0	0	0
Wind River IR Class II	0	0	3	1	0	0	1	0

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ATTACHMENT A

Review of Information on Health Effects

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REVIEW OF INFORMATION ON HEALTH EFFECTS

Introduction

In response to the findings of ambient air quality potential impacts in the Powder River Basin of Montana and Wyoming, resulting from current and projected development, this Attachment contains a summary of published information regarding potential health effects from Particulate Matter (PM). The modeled impacts showed the potential for PM_{10} concentrations to exceed the 24-hour ambient standards. The modeled exceedances were confined to a small number of receptors generally near major source development, such as coal fired power plants and coal mines.

Air monitoring station data collected for 2004 in Montana showed no exceedances of the 24-hour PM_{10} standard.

PM10 Health Effects: The health effects of short-term particulate concentrations on the public health have been reviewed in great detail, and were again reviewed as a part of the EPA-mandated evaluation of current ambient air quality standards. The most recent review (EPA 2004a: *Air Quality Criteria for Particulate Matter,* EPA/600-P-99/002aF, October 2004) focuses on the establishment of the alternate $PM_{2.5}$ standards and discussed PM levels in general. The study summarizes both morbidity and mortality of potential impacts for both short term and long term exposures. The current standards for PM_{10} (150 $\mu g/m^3$ for 24 hours and 50 $\mu g/m^3$ for annual standards) are focused on protecting against morbidity and mortality effects. The study re-iterates a previous conclusion that "Efforts to quantify the number of deaths attributable to, and the years of life lost to, ambient PM exposures are currently subject to much uncertainty."

Recently a new PM standard ($PM_{2.5}$) has been promulgated, and state regulatory agencies are currently implementing programs to address those standards. $PM_{2.5}$ levels are being measured at Lame Deer in the study area, and results show that those levels are below the established ambient standards.

The potential impacts of PM concentrations are focused on sensitive populations, including those with existing cardiopulmonary disease. Nine percent of adults and eleven percent of children are diagnosed with asthma. There is some evidence that socioeconomic status also plays a role in predicting exposure and impact of PM levels of concern.

The study concludes that "Of concentration–response functions for PM-related effects, it can generally be said that the effect estimates are small in magnitude. In historical episodes with very high air pollution levels, risks on the order of a four-fold increase in mortality were estimated, but much smaller risk estimates have been reported from recent studies at current pollution levels."

"Relative risk estimates for total mortality from the prospective cohort studies fall in the range of 7 to 13 percent increase per 10 $\mu g/m^3$ increase in $PM_{2.5}$; there are no significant associations with long-term exposure to $PM_{10-2.5}$. Risk estimates from the short-term exposure studies are considerably smaller in magnitude, on the order of 2 to 6 percent increase in mortality per 25 $\mu g/m^3$ increase in $PM_{2.5}$ and $PM_{10-2.5}$."

"Effect estimates for morbidity responses to short-term changes in PM tend to be larger in magnitude that those for mortality; those for hospitalization generally range from 4-10 percent increases for cardiovascular diseases and 5-15 percent increases for respiratory diseases per 25 $\mu g/m^3$ increase in $PM_{2.5}$ and $PM_{10-2.5}$. From the more recent studies on visits to the emergency department or physicians' offices for respiratory conditions, effect estimate sizes have been somewhat larger, ranging up to about 35 percent per 25 $\mu g/m^3$ increase in $PM_{2.5}$."

As is indicated in the referenced EPA study, the predictive impact of these studies on individual small communities is subject to much uncertainty. However, given the fact that predicted impacts that exceed the 24-hour ambient air quality standard for PM_{10} are in remote, generally unpopulated areas, and that sensitive populations would generally not be confined to these areas, it is unlikely that the modeled impacts of PM_{10} levels would lead to any actual increase in morbidity or mortality of specific receptor populations.

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ATTACHMENT B

Review of Mitigation Measures

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REVIEW OF MITIGATION MEASURES

Model results have indicated the potential for PM_{10} to exceed the 24-hour regulatory standard. In addition, both PM_{10} and NO_x have the potential to impact visibility within PSD Class I and Class II areas. The following mitigation measures for PM and NO_x are those that are commonly employed to control air emissions. Other mitigation measures could be employed to achieve a desired control, including in tribal designated Class I areas, such as the Northern Cheyenne Indian Reservation. Additionally, through the air permitting process regulatory agencies may require specific controls based on the volume and type of emissions or the location of the emission source.

Mitigation of PM: Emissions of $PM_{2.5}$ and PM_{10} from industrial operations can be subjected to a wide range of mitigation activities or controls. Emissions of these pollutants from industrial sources, including stacks or vents, are often controlled satisfactorily by employing bag filters or electrostatic precipitators. Emissions of $PM_{2.5}$ and PM_{10} from these sources is generally subjected to review by air permitting agencies, because the nature of the source would trigger the need to obtain an air permit to construct such a facility. Any modifications to those facilities would also trigger the need to obtain such a permit. As a part of the review of those permits, agencies ensure that emissions are controlled and that impacts are with acceptable concentrations.

The $PM_{2.5}$ and PM_{10} emissions from fugitive sources, such as material stockpiles, construction operations, and material handling operations are also subject to potential mitigating controls. As impacts are identified, any impacts of concern can be addressed by imposing the related mitigation measures.

In general the mitigation measures that can be employed for materials handling, construction, hauling operations, and storage activities can be summarized as in the list of activities below.

(1) Surface exposure. When vegetation is removed from the right-of-ways for hauling or construction activities, applicants shall clear the smallest possible amount of cover to minimize the impact of wind erosion and fugitive dust.

(2) Revegetation. Where vegetation has been removed, and soils exposed, begin revegetation as soon as possible, and enhance revegetation with mulching or matting to stabilize the surface and promote plant growth.

(3) Construction or soil excavation. For exposed active construction surfaces and related stockpiles, include dust suppression activities such as surface watering or stabilization with chemical surfactants.

(4) Construction and handling during windy periods. Restrict construction or material handling operations during periods with high winds, such as a threshold of 30 miles per hour. Enhance surface water sprays as an option.

(5) Hauling operations. Maintain all haul roads that are continually active by surface watering, chemical stabilization, restricted vehicle speeds, and removal of all spillage onto the roadway surface. Cover and maintain the roadways with dust-inhibiting material to include gravel or small rocks.

(6) Construction equipment operations. Require the use of high quality (low sulfur) diesel fuel in all diesel-fired construction or operational engines. Maintain all engines in satisfactory operating conditions.

Mitigation of NO_x: NO_x, which includes nitrogen oxide (NO) and nitrogen dioxide (NO_2), is produced as a byproduct of combustion. Efforts aimed at controlling NO_x emissions and ambient air impacts can be focused on either decreasing the emissions or increasing the dispersion.

The EPA has researched mechanisms that govern the formation of NO_x during combustion as a basis for reducing NO_x emissions from combustion sources. EPA's early efforts focused on the prevention of NO_x through modification of the combustion process, since this approach held the promise of higher emissions reductions and greater economic efficiency than the use of flue gas treatment for NO_x control. There have been significant advances in combustion technology which can reduce the primary production of NO_2 at the combustion source. Control of NO_x is a complex process affected by the nitrogen content of the fuel, the amount and distribution of air in the combustion process, temperature, unit load, and burner design, among other factors. Therefore, NO_x emissions can vary significantly with changes in temperature and air/fuel mixing, and are controlled primarily by modifying the basic combustion process, with the result that combustion modification NO_x controls directly affect not only emissions, but often the efficiency and operability of the unit as well.

Flue gas control of NO_x consists of adding secondary control systems to the exhaust gas from a combustion process. Types of secondary control systems include selective catalytic systems, non-selective catalytic systems, chemical scrubbers, and wet scrubbers. In most cases, these types of control systems require periodic replacement, regeneration, or disposal of wastes resulting from their actions, which leads to increased costs for operation.

Another alternative for NO_x emissions control is to eliminate the combustion source and replace it with an electric process. Electric motors can be used to replace combustion driven engines.

Increased dispersion of NO_x emissions does not reduce emissions at the source, but acts to reduce near field impacts by spreading the emissions over a larger area. Enhanced dispersion can be achieved by increasing the buoyancy of the emissions or increasing the height of the emissions release in relation to the topographic surroundings. Buoyancy can be increased by increasing the temperature of the exhaust or by increasing the exhaust flow velocity. Release height is governed by good engineering practices, which limits the actual stack height allowed in relation to existing surrounding features, or a maximum allowable height, whichever is less.

Another mitigation alternative includes the regulatory permitting process, which would act to protect ambient air quality by preventing the issuance of permits in areas that would experience significant impacts from additional permitted sources.

The following mitigation measure are commonly employed to prevent potential impacts from NO_x which could lead to exceedances of federal or state ambient air quality standards:

(1) Implement Best Available Control Technology (BACT) for the emissions unit. For compressor engines, this can result in NO_x emission rate of 1 g/bhp-hr, which is lower than the 1.5 g/bhp-hr rate used in the modeling.

(2) Utilize electric powered compressor engines in place of fuel combustion sources. Using electric-powered compressor motors in place of the typical natural gas-fired compressor engines could eliminate primary NO_x emissions from compressor stations.

(3) Use alternative fuels, which have lower fuel nitrogen content. Natural gas-fired compressor engines typically have lower NO_x emissions than diesel-fired engines.

(4) Increase dispersion of NOx emissions to reduce near field impacts by spreading emissions over a larger area.

(5) Use of regulatory permitting to prevent new or additional sources into areas where their emissions would cause significant impacts to ambient air quality identified through the permitting process.

HYDROLOGY APPENDIX

Summary of Water Resources Technical Report

Introduction

During the second half of the 1990s, coal bed methane (CBNG) production increased dramatically nationwide to represent a significant new source of natural gas to meet ever-growing energy demands. In Montana, oil & gas development has been growing since the first oil wells were drilled in the early 20th century. There are currently more than 200 commercially producing CBNG wells in the state of Montana, all of which are located in the Powder River Basin near the town of Decker, Montana. CBNG development in the Montana portion of the Powder River Basin (PRB) is in part a result of successful development in the Wyoming portion of the basin where CBNG activity started as early as 1993 (Flores et al. 2001).

A primary intent of the Montana CBNG Environmental Impact Statement (EIS) is to provide an overall projection of impacts associated with CBNG development for the planning areas and to address issues raised as part of the public scoping process. Of primary consideration for the EIS are water resources. Due to the extraction methods required for CBNG production, impacts to surface water and groundwater can potentially result from CBNG development. The purpose of the Water Resources Technical Report (WRTR) (ALL 2001b) is to serve as one of many supporting documents for the subject EIS. Following is a short summary of the WRTR.

Study Area

The planning area for the EIS is defined as the area where oil and gas decisions will be made by the BLM and the State of Montana. The BLM's planning area is the oil and gas estate administered by the BLM in the Powder River and Billings Resource Management Planning (RMP) areas. The State of Montana's planning area is statewide, with emphasis on the state-administered oil and gas within the BLM planning area and in Blaine, Park and Gallatin counties. The planning area excludes those lands administered by other agencies (for example, Forest Service and Tribal Councils). For ease of reference, the Billings and Powder River RMP areas, and Blaine, Park, and Gallatin counties, are referred to in the document as the BLM and State "CBNG emphasis area." This is the 16-county area within the BLM and state planning area where CBNG development interest has been identified.

CBNG Production Operations

During CBNG production, water is pumped up a tubing string to be put into a water flow-line for handling or discharge. At the only producing CBNG field in the Montana portion of the PRB, the water is either used in drilling new wells, pumped into ponds for use by the land owner, or discharged to the Tongue River through a MDEQ discharge permit. Assessment of management alternatives requires an accurate estimate of the amount of produced water to be produced from each well. CBNG wells must pump water from the reservoir to lower pressure within the coal, to augment the formation of cleat, and to allow the natural gas to break out as a discrete phase. The amount of water that must be pumped off appears to vary not only from reservoir to reservoir, but also during the history of each individual producing well according to the specific coal bed reservoir it is producing from, and its proximity to other producing wells. The WRTR compiles average water production rates for approximately 200 wells in the CX field normalized to the age of each well (MBOGC oil and gas database). This data was prepared by averaging the water production rates from active CBNG wells during each month dating from the date of first production. The exponential trend line is extrapolated from this data is: $Q = 14.661e^{-0.0242t}$ When Q is discharge per well in gallons per minute (gpm), and t is time in months. This indicates that initial discharges are approximately 15 gpm per well, and the 20-year average discharge would be 2.5 gpm. It should be noted that although the average initial discharge is approximately 15 gpm, some wells have discharges as high as 20-25 gpm.

Regional Geology

The planning area of the EIS centers on the Powder River RMP area and the Billings RMP area. The planning area contains three major basinal features – Powder River, Big Horn, and Bull Mountains – and surrounding uplifted areas. The asymmetric basins are the result of sedimentary deposition and structural subsidence with most of the fill consisting of the Fort Union Formation. The Fort Union Formation also contains most of the coals occurring in these three basins.

Fort Union Formation

The Fort Union Formation encloses the various coal seams within the Montana portion of the PRB; these coals function as the source and reservoir for the CBNG, as well as aquifers carrying groundwater of varying quantity and quality. Depth to coal seams in the Montana portion of the PRB range from exposure at ground surface to 1,000 feet or more below land surface. Coal thickness varies from thin stringers to over 50 feet and can form aggregate thicknesses that exceed 100 feet. Coal seams in the Fort Union do not have significant matrix porosity and permeability; they can act as aquifers because fluids such as water and methane are contained within the coal's fracture system, known as cleat. The fractures accumulate the fluids and allow the fluids to move horizontally and vertically.

Quaternary Alluvium

Quaternary age sediments are those that are Pleistocene (the latest glacial episode) and Recent (post-glacial episode) in age; the sequence is dominated by events and effects associated with continental glaciation, including glacial till and exaggerated peri-glacial valley fill. Quaternary sediments in the PRB and most of the state are present as variable fill in stream and river valleys. Quaternary Alluvium consists of unconsolidated sand, silt, and gravel that make up the floodplains and stream terraces of creek valleys in the PRB. Alluvium aquifers are largely unconfined and connected to active river flow. Because alluvial aquifers can deliver large quantities of water-to-water supply wells, they are important stratigraphic features. Alluvial aquifers can be impacted by surface activity and can act as a conduit to carry those impacts to valuable surface water resources.

Hydrology

Hydrology identifies aquifers (porous units containing water) and aquitards (non-porous strata that serve to confine and separate aquifers) in a geographic and vertical sense. Aquifers can contain drinkable water, brackish water of limited usability, or salt water. In the EIS planning area, several formations contain drinking water but show variable reservoir quality and water quality. The Montana portion of the PRB includes many aquifers that represent different hydrologic flow regimes. The basin includes unconfined aquifers as well as confined, bedrock aquifers. Aquifers range from the unconfined Quaternary alluvium in the streambeds of rivers and creeks to the Mississippian Age Madison Formation in excess of 10,000 feet below the surface. The water quality within these aquifers ranges from less than 300 mg/L TDS to more than 30,000 mg/L TDS. The aquifers also vary in depth from the basin center to the margin. Coal aquifers are widespread, supply large numbers of water wells, and will be impacted most by CBNG production. Alluvial aquifers are commonly unconfined and in direct contact with surface water and can, therefore, be impacted by surface discharge of CBNG water.

Watersheds

Watersheds are important to predicting the impacts from CBNG development in Montana. Water resource factors such as water quality, water use, and potential impacts are discussed throughout the report in terms of watersheds. Each watershed is drained by a single stream or river and each is bounded by a no-flow topographic boundary. Streams and rivers are profoundly influenced by their watersheds; in particular water volume and water quality vary from base flow conditions to high-flow conditions under the control of runoff from land surfaces and recharge to rivers by aquifers. The WRTR highlights the watersheds in the PRB along with potential CBNG areas.

Groundwater Quality

Quality of groundwater resources are detailed in the WRTR. The report lists quality statistics for the major aquifers from various parts of the CBNG emphasis area with emphasis on the coal seam aquifers.

Water Resources Impact Issues

Groundwater Drawdown from CBNG Development

Groundwater drawdown from CBNG production has been documented inside and adjacent to existing production in Montana. CBNG production in the PRB requires drawdown of coal aquifers within the producing field in order to liberate methane. Water wells and springs to but outside of a producing CBNG field may also be impacted. Drawdown can be documented by way of dedicated monitoring wells or by gauging private water wells. In Montana's CX Ranch CBNG field, the MBMG has installed monitoring wells designed to track drawdown due to the coal mines in the area as well as CBNG development.

Surface Water Impact from Discharge

Impacts to surface water from discharge of CBNG water can be severe depending upon the quality of the CBNG water. Some watersheds may be able to absorb the discharged water while others are sensitive to large amounts of low-quality CBNG water. Surface water quality in the watersheds is tabulated in the WRTR. Water quality data is from stream gauging points maintained by the USGS; these multi-year collections of water quality data illustrate changes within the stream from times of high run-off (typically June for the PRB) when the river is the highest and water is mostly the result of precipitation from spring rains and melting snow. During periods of high flow the streams and rivers contain higher quality water. The USGS data also contains data on base-flow conditions (typically winter in the PRB) when streams are at their lowest flow and water quality is the lowest since much of the water is recharge from alluvial and bedrock aquifers where groundwater is often of low quality. Discharge scenarios are described and resultant water quality is computed on a watershed basis.

Mitigation

CBNG production in the Montana PRB will certainly impact groundwater. Impacts to groundwater resources may however be mitigated through the use of water well agreements, limits placed on discharge and monitoring programs. Furthermore, a predictive model may be helpful as an approximation of future impacts. Groundwater rights will be protected through the use of spring/water well mitigation agreements and an approved monitoring plan to aid in the identification of potentially significant drawdown impacts. Surface water resources can be protected by limiting discharge through alternative management techniques.

Conclusions and Attachments

The WRTR concludes with a list of key water resource factors that are important to the subject of impacts. The appendices contain several pertinent documents as well as groundwater drawdown data from monitoring wells in the vicinity of the CX Ranch field, decline analysis from the CX Ranch field, and groundwater quality data from coal seam aquifers.

TMDL Schedule for CBNG Emphasis Area of Montana

Section 303 (d) of the Federal Clean Water Act and Sections 75-5-701 MCA, et. seq. of the Montana Water Quality Act requires Montana to develop "Total Maximum Daily Loads" (TMDLs) for lakes, rivers, and streams that are not meeting water quality standards. A TMDL is the amount of a pollutant that a waterbody can assimilate from point, non-point and natural sources and still meet water quality standards. In short, TMDLs guide the development of discharge targets for contributing sources that once implemented will restore or protect water quality.

All waters in Montana have been assigned to one of nine classifications based upon their presumed ability to support certain beneficial uses (i.e. drinking water, recreation, fisheries and aquatic life, agriculture, and industrial uses). Each classification has specific water quality standards including numerical and narrative limits. Waters that fail to meet the numerical or narrative standards are considered impaired. Montana must develop one or more TMDLs for each impaired waterbody.

In accordance with Section 303(d) of the Federal Clean Water Act, the Montana Department of Environmental Quality (MDEQ) has prepared a list of impaired and threatened waters every two years since 1992. This so called "303(d) list" identifies lakes, rivers and streams that are not meeting water quality standards and establishes priorities for TMDL development. However, Montana like the rest of the nation was slow to develop TMDLs.

On June 21, 2000, the United States District Court of Montana ordered EPA to work with the State of Montana to develop and adopt a schedule that would result in developing all necessary TMDLs for waters on Montana's 1996 Section 303(d) list (EIS Table 3-6) by May 5, 2007. On November 1, 2000, MDEQ and EPA published a schedule that was based upon a watershed or planning area approach. MDEQ divided the state into 91 TMDL Planning Areas each with a deadline for completing all necessary TMDLs. Since that time, an agreement has been reached to extend these timelines such that all TMDLs will be completed prior to May 5, 2012 (Yashan, pers. com., 12/8/05). This revised schedule is shown graphically on Figure HYD-1. The surface waters most likely to be affected by CBNG development are located in the Tongue Powder and Rosebud TMDL Planning Areas. The TMDL analyses for these areas are currently underway.

Independent of the court order, but as required by the Federal Clean Water Act and the Montana Water Quality Act, MDEQ prepared a 303(d) list in 2004. The 2004 list was finalized with EPA approval on November 24, 2004. It is superior to earlier lists for several reasons. First, significantly more data was available for making listing decisions. Second, the public review process was substantially expanded including a lengthy comment period and public meetings around the state. Third, MDEQ significantly improved the methods for making listing decisions. Fourth, MDEQ dramatically improved the supporting documentation for all listing decisions and made the information easily accessible by the public.

Although the court order mandates the 1996 list (EIS Table 3-6) as the starting point, both the 1996 and the 2004 lists should be consulted when making TMDL decisions. Figures HYD-2 to HYD-4 provides a summary of the waters in the Tongue, and Rosebud Creek basins that are on the 2004 list. No segments of the Powder River are on the 2004 list. The accompanying tables (Tables HYD-1 to HYD-3) identify the pollutants of concern and summarize the reasons for the listings.

The MDEQ or EPA is required to develop *all necessary* TMDLs for each waterbody and pollutant identified as impaired or threatened on the 1996 list. A TMDL may not be necessary for a waterbody listed on the 1996 list for a couple of reasons. First, a TMDL is unnecessary if further assessment, such as was done for the 2004 list, determines that the waterbody is meeting water quality standards for the particular pollutant. During the development of the 2000, 2002, and 2004 lists, MDEQ determined that several waters in the Tongue, Powder, and Little Powder river basins that were listed as impaired on the 1996 list, were actually meeting water quality standards (i.e., Mizpah Creek was found to be fully supporting for nutrients, dissolved oxygen, inorganics and suspended solids). Second, EPA has determined that TMDLs are not necessary for "pollution" that is not associated with a specific pollutant (i.e., flow or habitat alteration). EPA described their position on this issue to MDEQ in a July 23, 2001 letter concerning a flow alteration TMDL for Big Creek, a tributary of the Upper Yellowstone River. It should be noted however, that further assessment frequently shows that flow or habitat alterations cause high levels of pollutants (i.e., flow and habitat alteration can cause violations of temperature standards).

Figure HYD-1:
A graphical display of MDEQ's TMDL Planning Schedule (obtained from P. Schade (MDEQ) on 12/9/05).

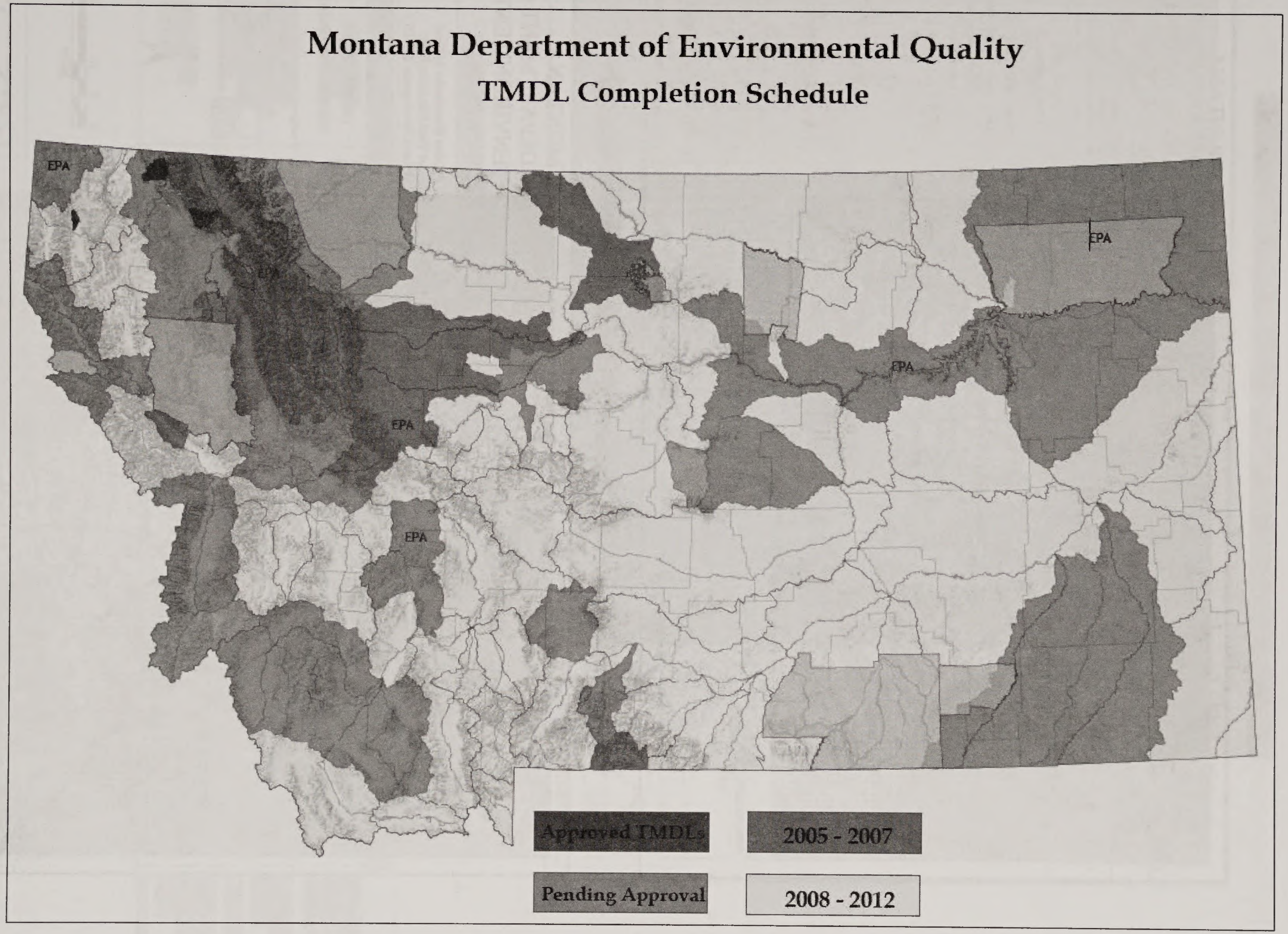


Figure HYD-2: Impaired Waterbodies in the Upper Tongue Watershed

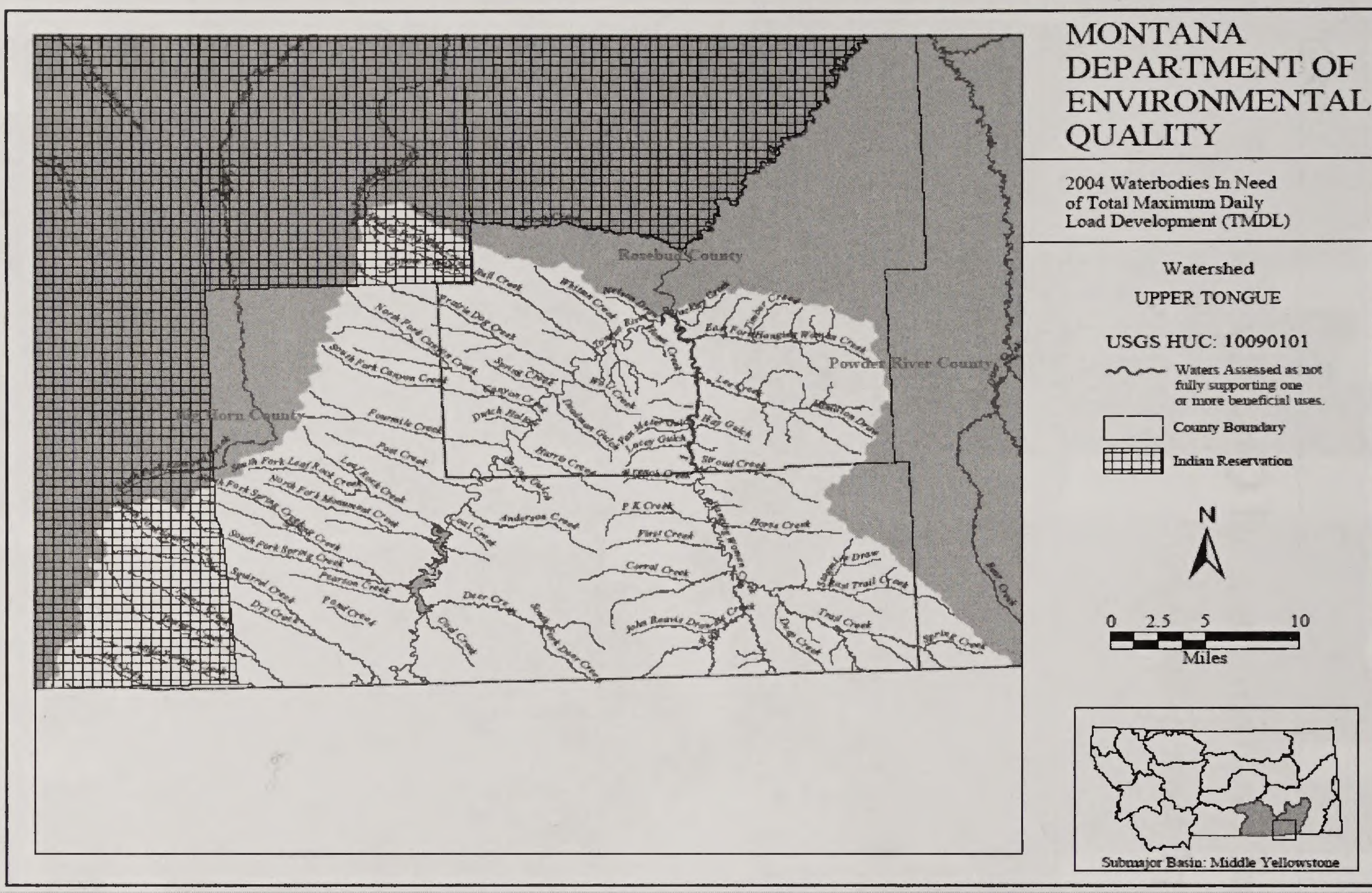


Figure HYD-3: Impaired Waterbodies in the Lower Tongue River Watershed

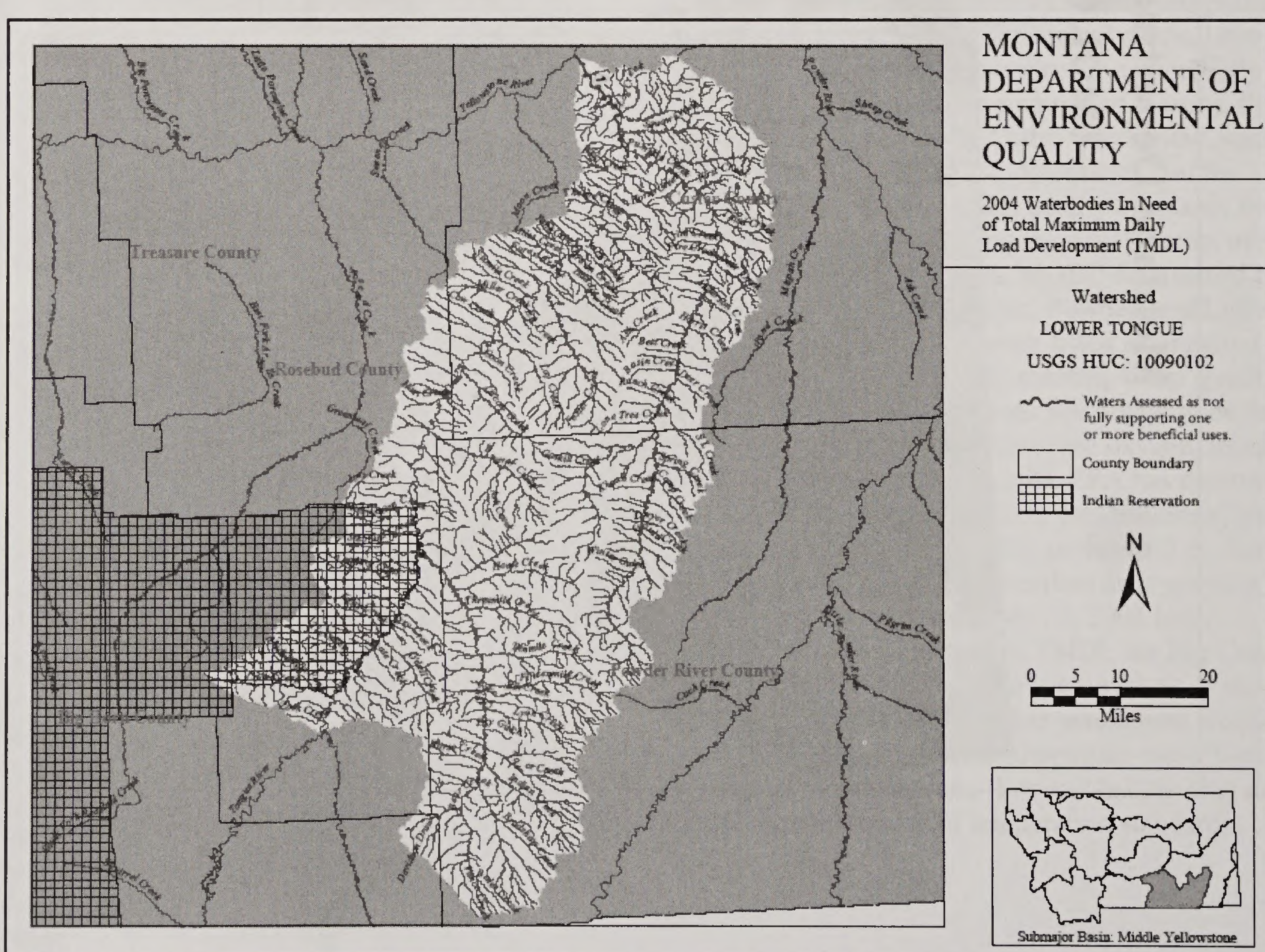


Figure HYD-4: Impaired Waterbodies in the Rosebud Creek Watershed

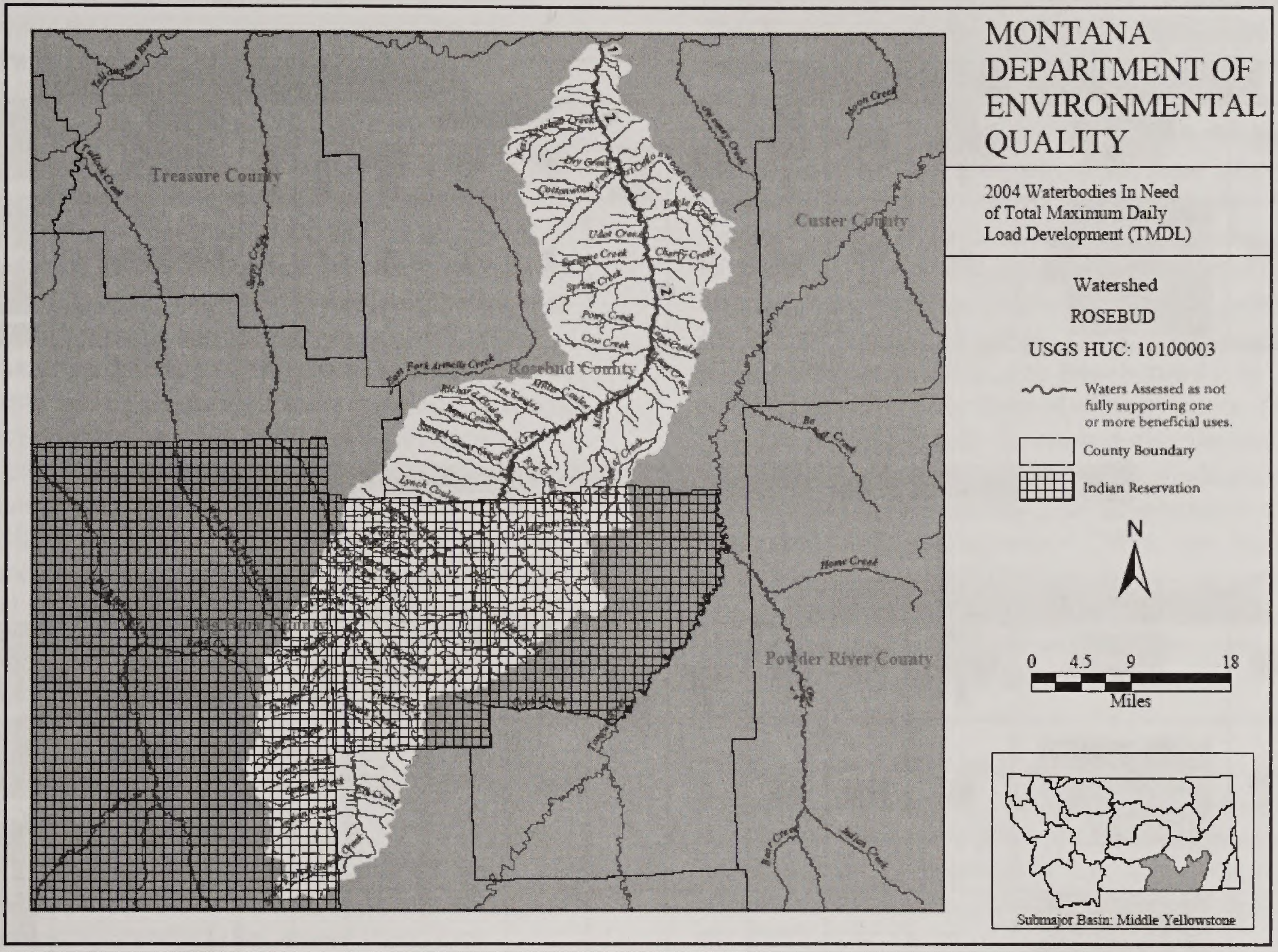


Table HYD-1: List of Impaired Waterbodies in the Upper Tongue River Watershed

Hydrologic Unit Code 10090101						Watershed UPPER TONGUE								
ID	Segment ID	Waterbody Segment	List Category	Size	Use Class	Use Support							Probable Causes of Impairment	Probable Sources of Impairment
						Aqua	Cold Fish	Warm	Drink	Swim	Agr	Ind		
1	MT42B002_031	Hanging Women Creek from Stroud Cr. To the mouth (Tongue R.)	5	18.5 M	C-3	P		P		X			Siltation	Grazing related sources Agriculture
2	MT42B003_010	Tongue River Reservoir	5	3500 A	B-2	P	X		X	P	F	F	Algal Growth/Chlorophyll a	Domestic wastewater lagoon Agriculture

Table HYD-2: List of Impaired Waterbodies in the Lower Tongue River Watershed

Hydrologic Unit Code		10090102				Watershed		LOWER TONGUE						
ID	Segment ID	Waterbody Segment	List Category	Size	Use Class	Use Support							Probable Causes of Impairment	Probable Sources of Impairment
						Aqua	Cold Fish	Warm	Drink	Swim	Agr	Ind		
1	MT42C001_011	TONGUE RIVER from diversion dam just above Pumpkin Cr. To the mouth (Yellowstone R.)	4C	20.4 M	B-3	P		P	X	P	F	F	Flow alteration	Dam Construction Flow Regulation/ Modification Hydromodificatio

Table HYD-3: List of Impaired Waterbodies in the Rosebud Creek Watershed

Hydrologic Unit Code		10100003				Watershed		ROSEBUD						
ID	Segment ID	Waterbody Segment	List Category	Size	Use Class	Use Support							Probable Causes of Impairment	Probable Sources of Impairment
						Aqua	Cold Fish	Warm	Drink	Swim	Agr	Ind		
1	MT42A001_011	ROSEBUD CREEK, From the mouth 3.8 mi upstream to an irrigation dam	4C	3.8 M	C-3	P		P		X			Bank erosion Other habitat alterations	Removal of Riparian Vegetation Habitat Modification
2	MT42A001_012	ROSEBUD CREEK, Northern Cheyenne Res. Boundary to an irrigation dam 3.8 mi above the mouth	5	105.8 M	C-3	X		P		X			Other Nutrients	Dam Construction Hydromodification

Although, during the preparation of the 2000, 2002, and 2004 lists the MDEQ determined that several waterbodies on the 1996 list were meeting the water quality standards for some of the listed pollutants, it was far more common for MDEQ to determine that there was insufficient credible data to make a listing decision. MDEQ determined that many segments of the Tongue and Powder rivers and some tributaries lacked sufficient credible data to determine whether the waters are impaired, threatened, or fully supporting the numerical and narrative water quality standards. These waters require additional assessment prior to developing TMDLs for the associated TMDL Planning Areas. The reassessment work has been conducted, and MDEQ is in the process of evaluating that data. It is possible that MDEQ will determine that additional waterbodies are meeting the standards for listed pollutants. If so, a TMDL will not be necessary, even though the waterbody and the pollutant were listed on the 1996 list. Conversely, additional TMDLs may be necessary if the assessment demonstrates that a waterbody is impaired for other pollutants that were not originally identified on the 1996 list.

The 1996 list identified many waters within the Tongue and Powder TMDL planning areas as impaired by salinity, total dissolved solids, chlorides, metals, inorganics, suspended solids, siltation, nutrients, low dissolved oxygen, pathogens, flow alteration, thermal modification, and habitat alteration. Of these pollutants, salinity, total dissolved solids, metals, and nutrients are frequently associated with produced water from CBNG development. Additionally, it should be noted that pollutants including salinity, total dissolved solids, and nutrients are also frequently associated with agricultural operations. CBNG development may also cause flow alterations and associated pollutants to exceed standards (i.e., total suspended solids).

As mentioned earlier, the court order prohibits MDEQ from issuing any new MPDES permits or renewals that would increase permitted discharges until all necessary TMDLs are established for a particular impaired waterbody. This provision of the court order has a direct bearing on CBNG development. Unless producers choose a no discharge option, such as reinjection, MPDES permits will be required for CBNG development. MDEQ and EPA are applying the court order on a pollutant-specific basis. For example, if the water is listed for nutrients and the new source will not discharge nutrients, a permit can be issued. Likewise, a permit can be renewed, if an existing source intends to increase its discharge but the effluent limit for nutrients will remain the same. Under some circumstances a permit can be issued even when the new discharge contains the pollutant of concern. By regulation, such permits must contain water quality based effluent limits that insure that the water quality standards will be met downstream of the discharge. For example, if the water quality standard is expressed as an in-stream concentration and the concentration in the discharge is less than the standard, the new source may actually improve water quality.

MDEQ is prohibited from issuing permits for discharges that would cause exceedances of a state water quality standard (i.e., where there is no assimilative capacity). This will be the case for many impaired waterbodies. Therefore, MDEQ will frequently not be able to issue a permit until a TMDL is developed for the entire watershed. A watershed TMDL will identify the major point and non-point sources contributing to the impairment and establish discharge targets for the pollutant of concern. In combination, the limits for all the sources must insure that water quality will improve to the point where the standards are met. The Montana Water Quality Act requires MDEQ to work with local landowners to implement voluntary measures (reasonable land soil and water conservation practices) to reduce pollutant loads from non-point sources. The Act also requires targets for point sources to be incorporated into MPDES permits in the form of effluent limits. The changes would normally be made during the next scheduled permit renewal and could include permits issued between now and the final development of the watershed TMDL. A watershed TMDL may include an allocation for growth to allow for new or increased discharges in the future and facilitate permitting. To provide for growth existing point and non-point sources would need to reduce their discharges even further.

Developing a TMDL takes time and involves completing the ongoing assessments; coordinating with landowners and CBNG producers in Montana, on tribal lands, and perhaps in Wyoming; assigning allocations for point and non-point sources; drafting the TMDL and a technical support document; conducting public meetings; and obtaining EPA approval.

Specific Electrical Conductivity (EC as uS/cm) and Sodium Adsorption Ratio (SAR) Limits for the Tongue, Powder, and Little Powder River Basins and Rosebud Creek

MONTANA DEQ NUMERIC STANDARDS FOR ELECTRICAL CONDUCTIVITY (EC) AND SODIUM ADSORPTION RATIO (SAR). ARM 17.30.670 (2003 Version)

(1) No person may violate the numeric water quality standards or the criteria for determining nonsignificant changes in water quality identified in (2) through (6). Compliance with the standards and criteria contained in (2) through (6) will be determined according to the procedures specified in (7).

(2) The numeric standards for electrical conductivity (EC) and sodium adsorption ratio (SAR) for the mainstems of Rosebud Creek, the Tongue, Powder, and Little Powder rivers from November 1 through March 1 are as follows:

(a) for Rosebud Creek and the Tongue River, the monthly average numeric water quality standard for EC is 1500 µS/cm and no sample may exceed an EC value of 2500 µS/cm. The monthly average numeric water quality standard for SAR is 5.0 and no sample may exceed an SAR value of 7.5; and

(b) for the Powder River and the Little Powder River, the monthly average numeric water quality standard for EC is 2500 µS/cm and no sample may exceed an EC value of 2500 µS/cm. The monthly average numeric water quality standard for SAR is 6.5 and no sample may exceed an SAR value of 9.75.

(3) The numeric standards for EC and SAR for the mainstems of Rosebud Creek, the Tongue, Powder, and Little Powder rivers from March 2 through October 31 are as follows:

(a) for Rosebud Creek and the Tongue River, the monthly average numeric water quality standard for EC is 1000 µS/cm and no sample may exceed an EC value of 1500 µS/cm. The monthly average numeric water quality standard for SAR is 3.0 and no sample may exceed an SAR value of 4.5; and

(b) for the Powder River and Little Powder River, the monthly average numeric water quality standard for EC is 2000 µS/cm and no sample may exceed an EC value of 2500 µS/cm. The monthly average numeric water quality standard for SAR is 5.0 and no sample may exceed an SAR value of 7.5.

(4) For all tributaries and other surface waters in the Rosebud Creek, Tongue, Powder, and Little Powder River watersheds, the monthly average numeric water quality standard for EC is 500 µS/cm and no sample may exceed an EC value of 500 µS/cm. The monthly average numeric water quality standard for SAR from March 2 through October 31 is 3.0 and no sample may exceed an SAR value of 4.5. The monthly average numeric water quality standard for SAR from November 1 through March 1 is 5.0 and no sample may exceed an SAR value of 7.5.

(5) For the Tongue River Reservoir, the monthly average numeric water quality standard for EC is 1000 µS/cm and no sample may exceed an EC value of 1500 µS/cm. The monthly average numeric water quality standard for SAR is 3.0 and no sample may exceed an SAR value of 4.5.

(6) Changes in existing surface or ground water quality with respect to EC and SAR are nonsignificant according to the criteria in 75-5-301(5)(c), MCA, provided that the change will not have a measurable

effect on any existing or anticipated use or cause measurable changes in aquatic life or ecological integrity.

(7) For purposes of determining compliance with the water quality standards and nonsignificance criteria for all parameters of concern in any new or increased discharge of unaltered ground water from coal bed methane development, the department shall determine effluent or compliance limits (e.g., evaluate the design of disposal systems) by using a flow-based analysis that considers a range of flows or monthly flow probability. With respect to EC and SAR, the department shall also use the median chemistry for the specified flow range or monthly flow.

(8) If any of the provisions of (6) or (7), or both of them, are declared to be invalid, then the numeric water quality standards and requirements specified in (1) through (7) shall be void. (History: 75-5-301, 75-5-303, MCA; IMP, 75-5-301, 75-5-303, MCA; NEW, 2003 MAR p. 779, Eff. 4/25/03.)

17.30.670 NUMERIC STANDARDS FOR ELECTRICAL CONDUCTIVITY (EC) AND SODIUM ADSORPTION RATIO (SAR) (2006 Version)

(1) No person may violate the numeric water quality standards or the criteria for determining nonsignificant changes in water quality identified in (2) through (6).

(2) The numeric standards for electrical conductivity (EC) and sodium adsorption ratio (SAR) for the mainstems of Rosebud Creek, the Tongue, Powder, and Little Powder rivers from November 1 through March 1 are as follows:

(a) for Rosebud Creek and the Tongue River, the monthly average numeric water quality standard for EC is 1500 µS/cm and no sample may exceed an EC value of 2500 µS/cm. The monthly average numeric water quality standard for SAR is 5.0 and no sample may exceed an SAR value of 7.5; and

(b) for the Powder River and the Little Powder River, the monthly average numeric water quality standard for EC is 2500 µS/cm and no sample may exceed an EC value of 2500 µS/cm. The monthly average numeric water quality standard for SAR is 6.5 and no sample may exceed an SAR value of 9.75.

(3) The numeric standards for EC and SAR for the mainstems of Rosebud Creek, the Tongue, Powder, and Little Powder rivers from March 2 through October 31 are as follows:

(a) for Rosebud Creek and the Tongue River, the monthly average numeric water quality standard for EC is 1000 µS/cm and no sample may exceed an EC value of 1500 µS/cm. The monthly average numeric water quality standard for SAR is 3.0 and no sample may exceed an SAR value of 4.5; and

(b) for the Powder River and Little Powder River, the monthly average numeric water quality standard for EC is 2000 µS/cm and no sample may exceed an EC value of 2500 µS/cm. The monthly average numeric water quality standard for SAR is 5.0 and no sample may exceed an SAR value of 7.5.

(4) For all tributaries and other surface waters in the Rosebud Creek, Tongue, Powder, and Little Powder river watersheds, the monthly average numeric water quality standard for EC is 500 µS/cm and no sample may exceed an EC value of 500 µS/cm. The monthly average numeric water quality standard for SAR from March 2 through October 31 is 3.0 and no sample may exceed an SAR value of 4.5. The monthly average numeric water quality standard for SAR from November 1 through March 1 is 5.0 and no sample may exceed an SAR value of 7.5.

(5) For the Tongue River Reservoir, the monthly average numeric water quality standard for EC is 1000 µS/cm and no sample may exceed an EC value of 1500 µS/cm. The monthly average numeric water quality standard for SAR is 3.0 and no sample may exceed an SAR value of 4.5.

(6) EC and SAR are harmful parameters for the purposes of the Montana Water Quality Act, Title 75, chapter 5, MCA. (History: 75-5-301, 75-5-303, MCA; IMP, 75-5-301, 75-5-303, MCA; NEW, 2003 MAR p. 779, Eff. 4/25/03; AMD, 2006 MAR p. 1733, Eff. 5/19/06.)

Montana Board of Environmental Review
March 23, 2006 Decisions Concerning New CBNG Water Quality Rules

Adopted

The Montana Board of Environmental Review (BER) adopted new rules for EC and SAR to be changed to harmful parameters. This designation triggers the non-degradation criteria under the Montana Pollutant Discharge Elimination System (MPDES) permitting process. It is consistent with Montana's management of other parameters with numerical water quality standards. The essence of the non-degradation criteria is to protect high quality state waters and limit discharges so changes to water quality would always result in levels of "harmful parameters" (in this case EC and SAR) between existing water quality levels and 40% of the existing water quality standards (there is also a 10% change limit for any discharge). For example, if the water quality standard is 1000 uS/cm a discharge permit would need to result in an instream water quality (after the mixing zone) not greater than 400 uS/cm. Whenever ambient conditions exceed 40% of the existing standards, no assimilative capacity is available, and any discharges resulting in a measurable increase would not be permitted (can not cause an increase, but could keep it the same or make it less). It should be noted that the three CBNG permits into the Tongue River already use up most of the assimilative capacity there.

This rule would apply statewide, however it is only effective at this point on water bodies with numeric water quality standards for EC and SAR (i.e., Tongue, Powder, Little Powder, and Rosebud watersheds).

Companies would have to treat water in the Tongue River to SAR and EC levels comparable to ambient water quality, which is below the existing standards if they wanted to discharge to waters of the state. Discharges into the Powder River and Little Powder River would also be limited because the ambient conditions in these water bodies often exceed 40% of existing standards. Plans for treating water by companies operating in Montana that have been approved by the Montana Department of Environmental Quality (MDEQ) involve treating water to a very low SAR, approximately 0.04, and EC to about 233 uS/cm and then mixing at a rate (approximately 75% treated water to 25% untreated water) to meet instream water quality standards at the end of pipe. Adoption of the proposed rule would probably require treatment of more water overall and curtail the ability to blend treated with untreated water before discharging.

The Wyoming DEQ would also be required to meet the non-degradation standards at the state line if the Montana standards are approved by the EPA.

The only way to obtain a permit if the 40% or 10% thresholds are exceeded would be to obtain a permit from the MDEQ to degrade. Although the MDEQ has a method for processing a permit to degrade, no such permits have ever been requested by any party in Montana.

Rejected

The BER rejected the portion of the proposed rule that requires injection of CBNG produced water and a rigorous process to bypass the requirement to use injection.

The Environmental Quality Council determined the proposed rule requiring CBNG companies to use injection as the initial method for disposal of produced water is outside of the jurisdiction of the Montana BER. Comments on the proposal from the public; the Environmental Quality Council findings; and the State's review (Montana Bureau of Mines and Geology Study) of the feasibility of injection in the Power River Basin are all reasons this portion of the rule was rejected.

Other Actions

The BER adopted the rule deleting the requirement to use a flow-based permit calculation method, and rejected the proposed rule to use the 7Q10 flow (lowest flow conditions). The MPDES section of the MDEQ has the discretion to use either method for calculating approved discharges for other MPDES permits, and has used both. This action

preserves the MDEQ's discretion to use either, or a combination of the two, and makes the analysis and calculation of CBNG produced water permits consistent with other MPDES efforts.

The BER postponed ruling on the requirement to treat CBNG waters and the effluent limits proposed for treatment. The BER directed the MDEQ to return a proposal to the Board on this matter after performing additional analysis of proposed effluent limitations and documentation of the technical, economic, and environmental feasibility and cost-effectiveness of those effluent limitations. This matter is scheduled to be presented to the BER at its September 29, 2006 meeting.

On March 10, 2006, the Northern Plains Resource Council (NPRC) proposed amending its own petition regarding effluent limits with an EPA-recommended statistical approach. This was proposed in response to numerous comments received on effluent limits of the proposed rule. The NPRC's March 10 proposal also included exceptions to a requirement to treat CBNG water for any permitted beneficial uses. No interested parties were provided an opportunity to review or comment on the amended language provided by the NPRC. The BER did not consider the March 10 proposal a part of the proposed rule making under review.

WQS for Electrical Conductivity (EC) and Sodium Adsorption Ratio (SAR) Adopted by the Northern Cheyenne Tribe

The Northern Cheyenne Tribe's EC and SAR numerical standards were adopted by the Tribal Council on May 28, 2002. The numerical standards apply to the Tongue River, Rosebud Creek and tributaries to each within the boundaries of the Reservation.

Tongue River and Rosebud Creek (within the Reservation Boundaries)	**Irrigation Season (4/1 - 11/15)**	**Criteria Applicable All Year**		**Notes**
	EC (30-day ave.)	EC (inst. max.)	SAR (inst. max.)	The Tribe has also adopted indicator values for total dissolved solids (TDS) that will be used to monitor conditions and trends of these waters.
Southern Boundary	1000	2000	2.0	
Northern Boundary	1500	2000	3.0	
Tributaries	1500	2000	3.0	

EXAMPLE WATER WELL MITIGATION AGREEMENT

WHEREAS, Owner has existing water wells within its property boundaries, providing Owner water for domestic and agricultural/livestock water, and

WHEREAS, Operator has acquired leases for the development of Coalbed Natural Gas (CBNG) and intends to drill and complete wells for production of CBNG, and

WHEREAS, the development and production of CBNG usually requires the production of water in conjunction with CBNG and may require the localized reduction of water levels within certain individual strata of the Ft. Union Coals, and

WHEREAS, Operator has advised Owner that the production of water in association with gas could adversely affect the productive capacity of Owner's existing water wells which draw water from the Ft. Union aquifer.

NOW, THEREFORE, as consideration for the mutual covenants herein, in order to facilitate the multiple usage of the natural resources consistent with sound environmental practices, to mitigate potential adverse affects on the Owner's water wells, to assure prompt and effective remediation, and to reduce the need for regulatory intervention by State and Federal agencies, the Owner and Operator agree as follows:

DEFINITIONS

Ft. Union Coals – The Ft. Union Coals, as used herein, shall mean those individual coalbeds or several coal beds contained within the Tongue River member of the Ft. Union Formation, bounded above by the Wasatch Formation of Eocene, and below by the Lebo Shale member.

Circle of Influence (COI) – The area that falls within a circle, the center of which is the location of a producing CBNG well, which has a radius of one mile (5,280 feet).

Impaired Water Well – Any water well or spring existing on the Owner's property within the COI, existing at the time of the CBNG development, that experiences a reduction of capacity to deliver water in quantity and/or quality sufficient to support the ordinary and customary use of the well or spring.

Strat Test – Any test well that is drilled with the purpose of obtaining geologic information that is not completed for production and is subsequently plugged and abandoned. Strat test may produce water and/or gas for a period not to exceed thirty (30) days without creating a COI.

CBNG Well – Any well drilled and completed for the production of CBNG that withdraws water and/or gas and water from the aquifer for a period exceeding sixty (60) days.

AGREEMENT

1. Upon the establishment of a COI, the Operator, at its sole cost and risk, will measure, or cause to be measured, the static water level and productive capacity ("the baseline measurement") of all water wells and springs within the COI and will attempt to determine the depth and configuration of these wells through consultation with the Owner and from the records of the Montana Department of Natural Resources. Upon request, Owner shall provide Operator with the location of all wells and springs within one mile of Operator's drilling operations. The Operator shall also test for the presence of methane in the water wells.

2. Owner shall, upon reasonable notice, allow the testing of water wells and springs within COI, including a static water level test which may require the cessation of withdrawals of water from the well or spring for a period not to exceed twenty-four (24) hours.

3. Operator shall establish a continuing water well monitoring program, the intent of which is to enable the Operator to identify changes in capacity of the Owner's water wells and springs within the COI. The Owner shall allow continued periodic testing of the water wells and springs within the COI for this purpose. Operator shall immediately provide all test data, both "baseline data" and monitoring data, to the Owner as it is acquired by Operator.

4. If a water well or spring within the COI becomes impaired as defined herein, Owner shall first take reasonable steps to verify that the impairment is not due to mechanical, electrical, down hole integrity, or pump problems, and, if none of these problems appear to be the cause of the impairment, Owner shall notify Operator of the impairment. Notice shall be made by phone and by writing, delivered by hand or by registered mail to the Operator at the above address.

5. Within sixty (60) days of the receipt of notice of impairment, Operator shall restore the Owner's access to water of sufficient quantity and quality to offset such impairment by reconfiguring, redrilling the well, the drilling of a new well, or by other means. It is recognized that additional power costs may be associated with any reconfiguration of an impaired water well which additional power costs shall be paid for by the Operator. The specific site of the well or water access may be changed by mutual agreement of Operator and Owner.

6. Operator agrees that upon notice of impairment and during the curative period, to provide and make available water for domestic and livestock usage in quantity, quality, and location required for the maintenance of normal and customary domestic, grazing, and livestock operations. Operator shall develop emergency procedures for immediate delivery of water to any such affected Owner within twenty-four (24) hour emergency contact. Owner shall make a good faith effort to inform Operator, by phone, fax, or other expedient method of communicating, of any impending loss or damage to livestock, allowing Operator a reasonable opportunity to mitigate such damage.

7. In the event it is determined that there is an impaired water well or spring, as defined above, in any COI, that COI shall be expanded based on the location of the impaired wells or springs. The COI shall be divided into quadrants (NE, NW, SW, SE) and based upon which quadrant the impaired water well or spring is located in, that quadrant shall be expanded by the area included within a arc one-eighth (1/8) of a miles wide (660 feet) outside the existing COI. Likewise, should it be determined that there is an impaired water well or spring within the expanded quadrant of the COI, that quadrant shall be again expanded by another 660 feet increment. This expansion approach shall be used to expand any COI in any direction where impairment is determined during the life of the CBNG well. Notwithstanding the above, if no water well or spring exists within the expanded area, the arc and associated quadrant shall be expanded to included the next nearest water well or spring.

8. At any time that the Lessee undertakes activities to enhance Owner's water well capacity or to restore Owner's impaired water well capacity, and should such activities require permits from regulatory agencies or permissions from third parties for surface entry, Owner shall aid and assist Operator in the obtaining of permits and permissions necessary to conduct the operations. All costs of the operations, including fees for obtaining permits and permissions, shall be borne by the Operator.

9. In the event that the interpretation or enforcement of this Agreement results in legal action, the costs of such action, including reasonable attorneys' fees, shall be borne by the individual parties, except in the event that the Owner is the prevailing party, in which case the Operator shall bear the costs and attorneys fees of the Owner.

10. The terms and provisions contained herein shall run with the land and shall be binding on the heirs, successors, and assigns of Owner and Operator. This Agreement shall terminate upon the expiration of the last Oil and Gas Lease or the Plugging and abandonment of the last CBNG well to which this Agreement applies, whichever is the later date.

This Agreement may be executed in any number of counterparts, each of which shall be considered an original.

OWNER:	**OPERATOR:**
Owner	Company
By:____________________________	**By:**____________________________

Montana Code Annotated 2005

TITLE 82. MINERALS, OIL, AND GAS
CHAPTER 11. OIL AND GAS CONSERVATION
Part 1. Regulation by Board of Oil and Gas Conservation

Sub-Part 175

82-11-175. Coal bed methane wells -- requirements.

(1) Coal bed methane production wells that involve the production of ground water must comply with this section.

(2) Ground water produced in association with a coal bed methane well must be managed in any of the following ways:

(a) used as irrigation or stock water or for other beneficial uses in compliance with Title 85, chapter 2, part 3;
(b) reinjected to an acceptable subsurface strata or aquifer pursuant to applicable law;
(c) discharged to the surface or surface waters subject to the permit requirements of Title 75, chapter 5; or
(d) managed through other methods allowed by law.

(3) (a) Prior to the development of a coal bed methane well that involves the production of ground water from an aquifer that is a source of supply for appropriation rights or permits to appropriate under Title 85, chapter 2, the developer of the coal bed methane well shall notify and offer a reasonable mitigation agreement to each appropriator of water who holds an appropriation right or a permit to appropriate under Title 85, chapter 2, that is for ground water and for which the point of diversion is within:

(i) 1 mile of the coal bed methane well; or
(ii) one-half mile of a well that is adversely affected by the coal bed methane well.

(b) The mitigation agreement must address the reduction or loss of water resources and must provide for prompt supplementation or replacement of water from any natural spring or water well adversely affected by the coal bed methane well. The mitigation agreement is not required to address a loss of water well productivity that does not result from a reduction in the amount of available water because of production of ground water from the coal bed methane well.

History: En. Sec. 4, Ch. 578, L. 2001; Sec. , MCA 2001; redes. by Sec. 1, Ch. 117, L. 2003.

Montana Code Annotated 2005

TITLE 76. LAND RESOURCES AND USE
CHAPTER 15. CONSERVATION DISTRICTS
Part 9. Coal Bed Methane Protection Program

76-15-901. Short title. This part may be cited as the "Coal Bed Methane Protection Act".

76-15-902. Legislative findings and declaration of purpose.

(1) The legislature finds that the need for an economical supply of clean-burning energy is a national and state priority.

(2) The legislature further finds that Montana possesses plentiful reserves of clean-burning natural gas contained in coal beds.

(3) The legislature further finds that the extraction of natural gas from coal beds may result in unanticipated adverse impacts to land and to water quality and availability.

(4) The legislature declares that there is a compelling public need to promote efforts that preserve the environment and protect the right to use and enjoy private property. The legislature further declares that the purpose of this part is to establish a long-term coal bed methane protection account and a coal bed methane protection program for the purpose of compensating private landowners and water right holders for damage to land and to water quality and availability that is attributable to the development of coal bed methane wells.

(5) The legislature further declares that the provisions of this part do not relieve coal bed methane developers or operators that own, develop, or operate coal bed methane wells and collection systems of their legal obligation to compensate landowners and water right holders for damages caused by the development of coal bed methane.

(6) The legislature further declares that the provisions of this part do not relieve coal bed methane developers or operators from:

(a) any liability associated with the exploration or development of coal bed methane; or

(b) the responsibility to comply with any applicable provision of Titles 75, 82, and 85 and any other provision of law applicable to the protection of natural resources or the environment.

76-15-903. Definitions. As used in this part, unless the context requires otherwise, the following definitions apply:

(1) "Agricultural production" means the production of:

(a) any growing grass, crops, or trees attached to the surface of the land; or

(b) farm animals with commercial value.

(2) "Coal bed methane developer or operator" means the person who acquires a lease for the purpose of extracting natural gas from a coal bed.

(3) "Department" means the department of natural resources and conservation as provided for in Title 2, chapter 15, part 33.

(4) "Emergency" means the loss of a water supply that must be replaced immediately to avoid substantial damage to a landowner or a water right holder.

76-15-904. Coal bed methane protection account -- use.

(1) There is a coal bed methane protection account in the state special revenue fund.

(2) There must be deposited in the account the proceeds from the distribution of oil and natural gas production taxes, as provided in 15-36-331.

(3) All money paid into the account must be invested by the board of investments. Earnings from investments must be deposited in the account.

(4) Subject to the conditions of subsection (5), money deposited in the account must be used to compensate landowners and water right holders for damages attributable to coal bed methane development as provided in this part.

(5) Money deposited in the fund and earnings of the fund may not be expended until after June 30, 2005. For fiscal years beginning after June 30, 2005, principal and earnings may be expended only in the case of an emergency. For fiscal years beginning after June 30, 2011, principal and earnings in the account may be expended for any purpose authorized pursuant to this part.

(6) Money in the account must be appropriated to the department for use by conservation districts that have private landowners or water right holders who qualify for compensation as provided in 76-15-905. *(Subsection (2) terminates June 30, 2011--sec. 10, Ch. 531, L. 2001.)*

76-15-905. Coal bed methane protection program -- restrictions.

(1) There is a coal bed methane protection program administered by conservation districts that have coal beds within the exterior boundary of the district or whose water sources may be adversely affected by the extraction of coal bed methane. The purpose of the coal bed methane protection program is to compensate private landowners or water right holders for damage caused by coal bed methane development.

(2) A conservation district shall establish procedures, approved by the department, for evaluating claims for compensation submitted by a landowner or water right holder. The procedures must include:

(a) a method for submitting an application for compensation for damages caused by coal bed methane development;

(b) a process for determining the cost of the damage to land, surface water, or ground water, if any, caused by coal bed methane development;

(c) the development of eligibility requirements for receiving compensation that include an applicant's access to existing sources of state funding, including state-mandated payments, that compensate for damages; and

(d) criteria for ranking applications related to available resources.

(3) An eligible recipient for compensation includes private landowners and water right holders who can demonstrate as the result of damage caused by coal bed methane development:

(a) a loss of agricultural production or a loss in the value of land;

(b) a reduction in the quantity or quality of water available from a surface water or ground water source that affects the beneficial use of water; or

(c) the contamination of surface water or ground water that prevents its beneficial use.

(4) (a) Subject to the conditions of subsections (5) through (8), an eligible landowner may be compensated for the damages incurred by the landowner for loss of agricultural production and income, lost land value, and lost value of improvements caused by coal bed methane development. A payment made under this subsection (4)(a) may only cover land directly affected by coal bed methane development.

(b) Subject to the conditions of subsections (5) through (8), an eligible water right holder may be compensated for damages caused by the contamination, diminution, or interruption of surface water or ground water.

(5) In order to qualify for a payment of damages under this section, the landowner or water right holder shall demonstrate that it is unlikely that compensation will be made by the coal bed methane developer or operator who is liable for the damage to land or the reduction in or contamination of surface water or ground water as the result of coal bed methane development.

(6) Compensation made to a landowner or a water right holder under this section may not exceed 75% of the cost of the damages. The maximum amount paid to a landowner or water right holder may not exceed $50,000.

(7) Conservation district administrative expenses for services provided under this section are eligible costs for reimbursement from the coal bed methane protection account.

(8) (a) Except as provided in subsection (8)(b), compensation for damages allowed under this section may be made only after June 30, 2011.

(b) Compensation for an emergency may be made after June 30, 2005.

MINERALS APPENDIX

MINERALS APPENDIX

Introduction

The *Minerals Appendix* contains a discussion of coal bed natural gas (CBNG) in the planning area, conventional oil and gas production trends, the Reasonably Foreseeable Development Scenario (RFD), and a description of the cumulative effects projects evaluated for this study.

Coal Bed Natural Gas

CBNG is a product of the transformation of plant material into coal; large volumes of methane are produced as coal matures due to heat of burial and the action of naturally occurring microbes. This methane-rich gas is adsorbed and stored on internal surfaces within the coal. The pressure of fluids (mostly formation water) in the coal reservoir keeps the methane adsorbed onto the coal. When meteoric waters encounter the methane-rich coals, bacteria act upon the coals and their entrained fluids to produce more methane (PTTC 2000). This biogenic methane-rich gas is also adsorbed onto the coal surfaces. Thermogenic methane can be differentiated from biogenic methane by the ratios of their stable carbon isotopes, that is, the ratio of C^{12} to C^{13} compared to a standard such as the PeeDee belemnite, a fossil marine mollusk (Coplen 1994). Methane with relative enrichment of C^{12} is indicative of low-temperature, biogenic gas; the heavier C^{13} isotope is enriched in the high-temperature gas. Both forms of methane have been reported in CBNG reservoirs (USGS 2000).

Coalbed gas reservoirs, because of their fine-grained nature, are able to hold six or seven times as much gas as conventional sand or carbonate reservoirs (USGS 2000), a factor that has made CBNG a desirable resource. Methane produced from coal beds is an unconventional hydrocarbon resource that has undergone rapid nationwide development in the past fifteen years (Nelson 2000). The Powder River Basin is estimated to contain approximately 39 trillion cubic feet [TCF] total gas in place (Hill et al. 2000)—approximately 10 percent of which is in Montana. The methane is contained in the Tertiary-age Fort Union Formation coal beds. Under initial reservoir conditions, the coal is under virgin hydrostatic pressure, which confines the coal and holds in the methane. Pumping water from the coal reduces hydrostatic pressure in the aquifer. The methane releases from the coal and moves through the natural cleat of the coal toward producing boreholes.

CBNG in Montana is currently produced only at the CX Ranch field in Big Horn County on the western edge of the Powder River Basin. During the first year of production, 1999, the field produced 204,433 MCF of natural gas. The subsequent year, 2000, the field produced 3.49 billion cubic feet (BCF) of natural gas (MBOGC 2001b). For 2004, the CX Ranch field produced 12.24 BCF of natural gas (MBOGC On-Line Data).

CBNG is prospective in the RMP areas that are the subject of this SEIS. In the Billings RMP area, the Bull Mountains Basin contains Fort Union Formation coals that may be similar to the Powder River Basin coals. CBNG resources are subject to the same drainage issues as conventional oil and gas resources. It is assumed that a single CBNG well will drain those resources in a single coal seam across 80 acres. Site-specific CBNG drainage may, however, be different and needs to be monitored to protect federal and Indian lands.

A study prepared at the request of Congress under a provision of the 2000 Energy Policy and Conservation Act (EPCA) was completed in 2002 by BLM, USGS, USFS, and the DOEs Office of Fossil Fuels and Energy Information Administration (EIA). The EPCA inventory, published in 2003 in both hardcopy and on CDs, provides estimates of undiscovered technically recoverable resources and proven reserves of oil and gas beneath five basins including the Powder River Basin (EPCA, 2003). The estimate of CBNG for the Powder River Basin (USGS Digital Data Series DDS-69-C, 2004) raised the technically recoverable amount of CBNG from 1.1 trillion cubic feet to 14.3 trillion cubic feet. The increase is accounted for by better data. Over the past 10 years, industry has drilled thousands of new wells, and information from these wells has provide a much better geologic definition of the unconventional oil and gas plays in the basin. In 1995 there were only two or three coal beds that were generating gas; but by 2004 it was found that other, deeper coal bed seams were generating more gas (ibid). The coal beds where CBNG is being produced in the Powder River Basin contain low-rank coal.

Of the 14.3 TCF estimated recoverable CBNG, the USGS estimates 5.0 TCF in Montana and 9.3 TCF in the Wyoming portion of the PRB.

In preparing this SEIS/Amendment, the updated EPCA estimate was considered for evaluation and alteration of the RFD. However, upon recognition of the original

method used to estimate the reasonable foreseeable development, it was noted that all possible CBNG wells over the next 20 years were accounted for, based on gas quantity per ton of coal present and potential drainage spacing. Therefore, considering the spacing (1 well/80-acre/coal seam), and the duration of the well life, it was felt that all known coal with the potential for CBNG production was accounted for and thus the gas present could be reached and extracted. No revision to the original number of CBNG wells predicted is necessary or was made.

Furthermore, the federal coal beneath the Custer National Forest was considered in the original RFD, and the EPCA estimate did not provide any new information with regards to the potential leasing or development of CBNG on the forest. Therefore, the original estimate for the Custer National Forest was not revised. Additionally the Ashland Ranger District has not completed an official RFD for the Custer National Forest nor has there been a leasing EIS proposed or scheduled for these minerals. Therefore, the existing estimate is adequate for the foreseeable future.

Conventional Oil and Gas Production Trends

Montana's oil production for 1999 was down by approximately 8 percent (from 16.61 million barrels of oil [mmbo] to 15.27 mmbo) from 1998. The oil production trend has been in place since 1984 when oil production began to decrease because of commodity prices. Due to increases in commodity prices, the rapid expansion of horizontal drilling, and improvements in secondary and tertiary recovery techniques, this downward trend started to reverse itself in 2000, and by the end of 2004 production had increased to 24.7 mmbo. Natural gas production increased by approximately 3 percent (59.7 BCF to 61.6 BCF) during 1998. Natural gas production has shown gradual increases in yearly production with an annual production for 2004 of 97.96 BCF (MBOGC On-Line Data). Drilling within the state for conventional oil and gas increased by approximately 55 percent from 1998 to 1999. Conventional oil and gas activity increased by approximately 27.2 percent from 2003 to 2004. Horizontal well completions continue to be popular in the state. In 1999, the Montana Board of Oil and Gas Conservation (MBOGC) gave approval for seven new horizontal wells and two horizontal re-completions of existing vertical wells. For 2004, the MBOGC approved 205 horizontal wells and 48 horizontal recompletions of existing vertical wells. In 1999, BLM approved four new horizontal wells and one horizontal recompletion. In 2000, BLM approved 13 new horizontal wells and 16 recompletions. In 2004, BLM approved 35 new horizontal wells and 36 recompletions as horizontal wells.

Figures MIN-1 and MIN-2 were constructed using the latest data available from the production files of the MBOGC.

Figure MIN-1

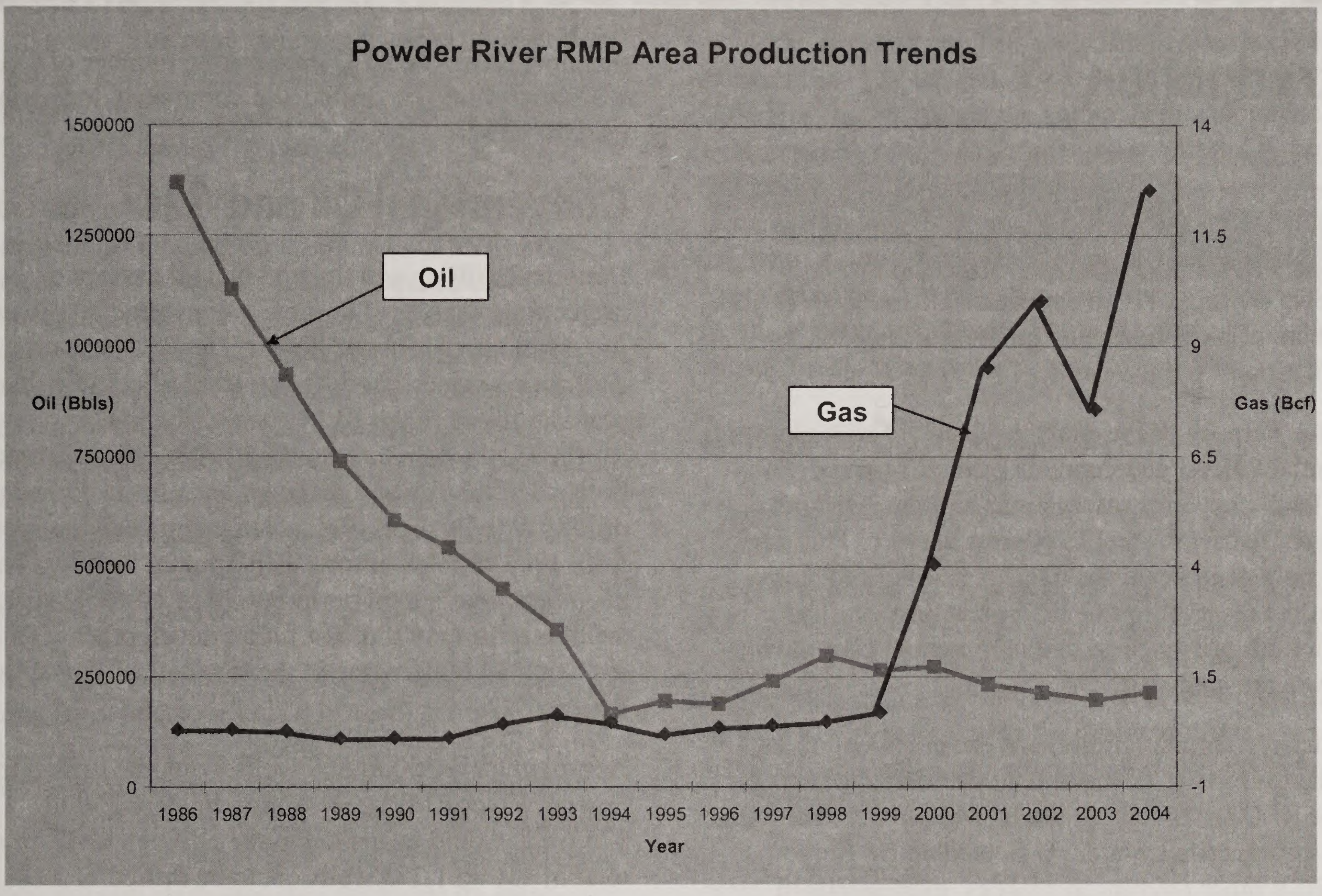
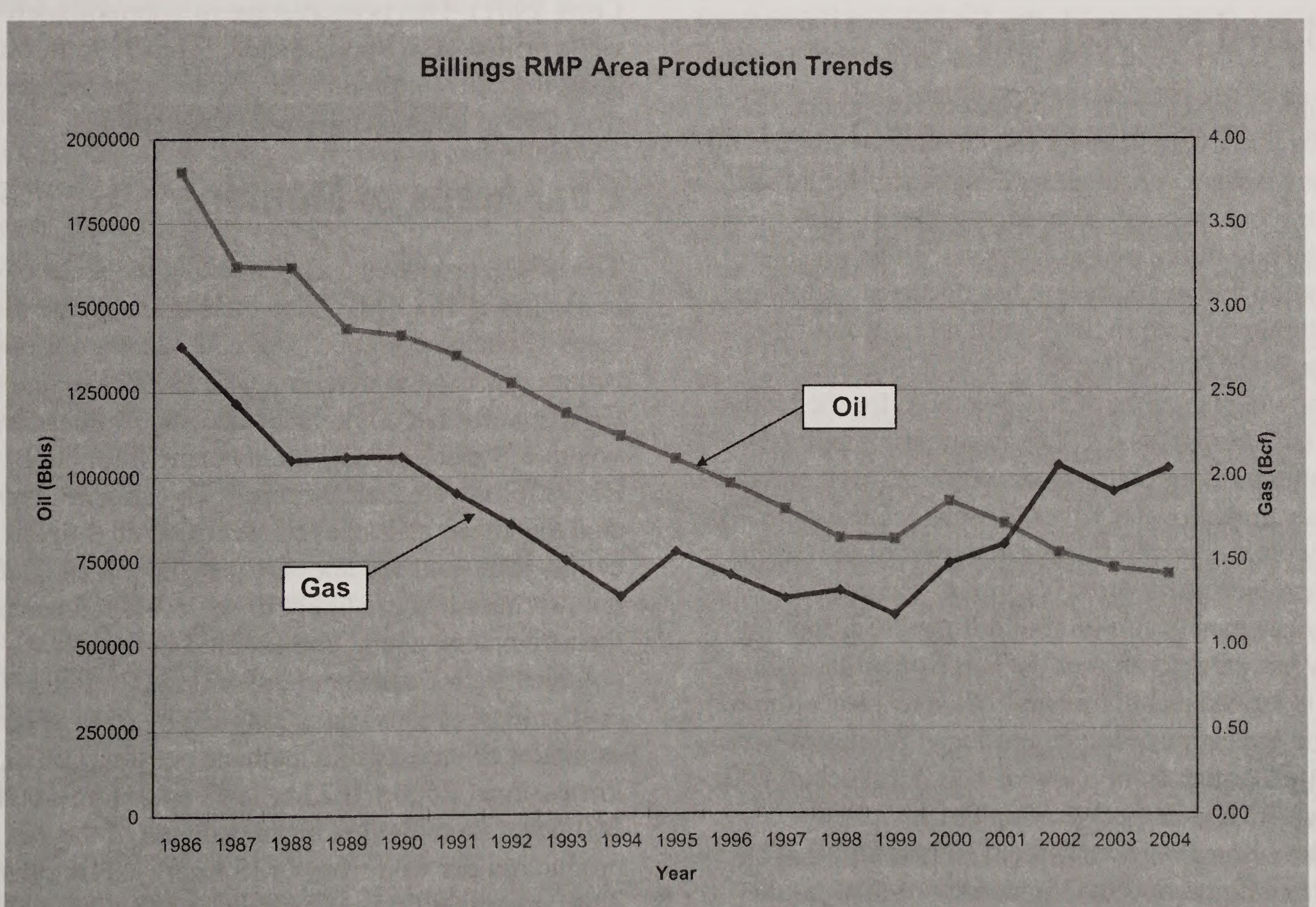


Figure MIN-2



REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

Introduction

The Reasonably Foreseeable Development (RFD) scenario for the SEIS predicts oil and gas development for the Powder River Resource Management Plan (RMP) area and the Billings RMP area. The RFD projects drilling of both conventional and CBNG wells, numbers of pipelines, and compressors needed for production of CBNG wells.

For the purpose of the analysis, the RFD will address potential CBNG development of the Crow and Northern Cheyenne reservations and the Ashland Ranger District of the U.S. Forest Service. This does not imply or indicate the BLM is making decisions about the reservations or the Forest Service. The predictions are made so that all potential cumulative impacts are analyzed.

Predictions for exploration and development of coal bed natural gas (CBNG) and conventional oil and gas in the RFD are based on: the BLM RMPs for the areas; coal information from the U.S. Geological Survey (USGS); other referenced sources; expressions of interest; and projections from the oil and gas industry (Oct 18, 2000, CBNG Coordination meeting).

Coal Bed Natural Gas

To project CBNG exploration and development, the areal extent of certain coals and the rank of coals in the study areas were considered. Areas of sub-bituminous to bituminous were considered as the most likely to be explored and developed in Montana, although exploration and development has occurred mainly in sub-bituminous coal in the Wyoming portion of the Powder River Basin (Basin). The USGS produced a map showing the areas of coal, by rank, for the United States (see Map MIN-1). This information indicates sub-bituminous and bituminous coals in many parts of the study area. Powder River, Rosebud, Custer, and Big Horn counties contain the northern part of the Basin, which extends north from Wyoming. Musselshell County has mostly sub-bituminous coal. Carbon County has an extension of the Big Horn Basin coal, which is ranked as bituminous coal. The projection of methane gas estimated to be produced from coal beds in Montana range from a low of 1 TCF (Crockett 2001-PRB est -RMG, Casper) to a high of 17.7 TCF (estimated based on figures from Nelson 2000). This and other information for Montana is used to predict where CBNG exploration is most likely to occur in the planning area. The RFD predicts the number of CBNG wells that would be drilled and completed during the next 20 years.

Conventional Oil and Gas

Historical drilling activity and oil and gas price projections were used to project conventional oil and gas development for the RMPs. The RFD scenario describes a somewhat different level of activity than the scenario found in the BLM *Final Oil and Gas RMP/EIS Amendment* issued in 1992. This is primarily because of the use of a different span for historical drilling activity. The 1992 amendment used the span from 1973 to 1988 in forecasting future activity. This document uses a total period of 80 years for historical drilling activity to forecast future development. This led to a slight difference in the level of drilling activity forecast.

Approximately 200 to 800 wells would be drilled in the Powder River RMP area. Approximately 250 to 975 wells would be drilled in the Billings RMP area. A total of 450 to 1,775 wells could be drilled in 20 years.

A total of 37,233 oil and gas wells have been drilled in Montana as of the 2003 FEIS (Petroleum Information Corp, 2001). This is an average of approximately 450 wells drilled per year statewide. From 1995 through 2004 the conventional wells drilled in the state ranged from 209 to 565 (MBOGC On-Line Data).

Coal Areas of Montana

The USGS produced a map showing the areas of coal in Montana. The RMPs also include maps that indicate areas of coal occurrence. The coal volume for each county was used to determine the number of potential CBNG wells that could be drilled. The values for volumes of coal in each county came from the BLM RMPs for the area, study papers, or estimates based on coal thickness, and acres of identified coal fields in the county. The coal volumes are based upon all coal beds, not just ones that are likely to be developed because of their thickness, depth, and extent. In all cases the volumes are estimates rather than exact figures. The coal volume in tons was multiplied by a range of estimates of recoverable methane per ton (USGS Professional Report 1625A, 1998 and Flores, et al. 2001) and then divided by an estimate of the gas production per well from CMS Energy's, October 18, 2000, presentation in Miles City (CMS 2000). The amount of gas to be produced per well (0.3 BCF per

well) would be used as the lowest economic limit. This resulted in a range of wells that may be drilled over the next 20 years. The coal volume data came mostly from the Powder River and the Billings RMPs, supplemented by information from USGS and Gas Technology Institute (GTI) papers (Nelson 2000).

Coal resources in the Powder River Basin are in the Paleocene Fort Union Formation. About half of the estimated 39 trillion cubic feet of in-place CBNG resource is recoverable. Less than half the coal resources occur in the Montana portion of the Basin. These sub-bituminous coals have low concentrations of gas per unit volume (Choate et al. 1984). However, because of the immense total coal thickness that reaches 170 feet in some areas in Montana (Campen 1990), vast quantities of CBNG may be present.

Gas Well Spacing

The MBOGC establishes the spacing of gas wells. Spacing for wildcat wells is 640 acres per well for each producing formation. MBOGC has the authority to change the well spacing to provide for maximum efficiency and recovery of gas reserves. Well spacing is usually changed after MBOGC has reviewed geologic, engineering and economic data provided by lease operators. The MBOGC then establishes the boundaries for a producing gas field. The planning area includes only one CBNG field and numerous conventional gas fields. When a field is discovered, the exploration company would appear before MBOGC to request permanent spacing for the production. Based upon current CBNG well spacing in Wyoming and Montana, spacing would probably range from one well per 80 acres to one well per 40 acres for CBNG production. The spacing in the CX field is four wells per coal bed per 160 acres. Because of the number of coals in the CX field, this could result in as many as 16 wells per 160 acres or potentially 64 wells per 640 acres. The well density has not reached this level at present and because of the faulting, splitting, and joining of the coals and absence of the coals in some sections this is not likely to happen. CBNG is produced from three coal seams in the CX field. Each well produces methane from a single coal seam; however, in the future, wells may be designed to produce from multiple coal seams. This would decrease the number of wells required for production in the CX field.

Oil Well Spacing

The MBOGC also sets the spacing of oil wells. The spacing for an oil well in the state of Montana is based on the depth of the well. For well depth of 0 to 6,000 feet, the statewide spacing is one well per 40 acres; for well depth of 6,001 feet to 11,000 feet, it would be one well per 160 acres; finally, for well depth of more than 11,001 feet, it would be one well per 320 acres. MBOGC has the authority to change the well spacing to provide for maximum efficiency and recovery of gas reserves. Well spacing is usually changed after MBOGC has reviewed geologic, engineering, and economic data provided by lease operators. The MBOGC then establishes the boundaries for the producing oil field. There are numerous fields within the planning area.

Areas of Disturbance

CBNG

Surface disturbance for a typical CBNG well includes 0.25 acres for the well pad and 0.75 acres for the access road for a total of 1 acre disturbed for drilling operations. Part of the well pad area is reclaimed for production operations, and the entire area of disturbance is reclaimed when the well is plugged and abandoned.

Conventional

Surface disturbance for a typical conventional shallow gas well (less than 2,000 feet deep) includes 0.5 acres for the well pad and a 2-mile bladed road for a total of 1 acre disturbed for drilling operations. Part of the well pad area is reclaimed for production operations, and the entire area of disturbance is reclaimed when the well is plugged and abandoned.

Surface disturbance for a typical shallow oil well (less than 5,000 feet deep) includes 2 acres for the well pad and 1.5 acres for a 1-mile bladed road for a total of 3.5 acres disturbed for drilling operations. Surface disturbance for a typical deep oil well (from 5,000 to 12,000 feet deep) includes 4 acres for the well pad and 1.5 acres for a 1-mile bladed road, for a total of 5.5 acres disturbed for drilling operations. Part of the well pad area is reclaimed for production operations, and the entire area of disturbance is reclaimed when the well is plugged and abandoned.

General Assumptions

- All numbers were rounded to the nearest significant number.
- The number of BLM-administered wells will be based on the BLM-administered oil and gas acreage in the county.

- 80 percent of Big Horn County is in the Billings RMP area.

Occurrence Potential

The text in this section discusses the oil and gas occurrence potential for each county.

Big Horn County

CBNG

The southeastern and eastern portion of the county contains approximately 28,700 million tons of sub-bituminous coal (Powder River RMP). The area includes one CBNG field (CX Ranch).

Conventional

The county has nine oil and gas fields, including four oil fields, one conventional gas field at Toluca, and an inactive gas field at Hardin. The oil and gas fields in Big Horn County produce from the Ft. Union, Shannon, Amsden, Madison, and Tensleep formations. Production has occurred from the Frontier formation (Hardin Gas field). A total of 844 wells have been drilled to date, of which 172 have been drilled on the Crow Reservation. One gas sales line runs through the north portion of Big Horn County, but none on the Crow Reservation.

Carbon County

CBNG

Carbon County includes the Silvertip, Bear Creek, Bridger and the Joliet-Fromberg coal fields. The coal ranges from Ft Union to Eagle coal and is of sub-bituminous to bituminous nature. The volume of coal is estimated at approximately 760 million tons. The estimate of the gas content of the coals for sub-bituminous will be the same as the coals in the Powder River basin. The estimate for the bituminous coals for the RFD will be from 200 to 450 standard cubic feet (SCF)/ton.

Conventional

Carbon County includes 18 identified gas and oil fields. The wells produce from the Frontier, Phosporia-Tensleep, Judith River, Claggett, Eagle, and Greybull formations. A total 735 wells have been drilled to date in this county (Dwights well data).

Carter County

CBNG

Bituminous or sub-bituminous coals have not been identified in Carter County. The only coal is of lignite rank, which is not considered to have a potential to produce methane in economic quantities.

Conventional

Carter County includes the Bell Creek, Southeast Bell Creek, and Repeat oil fields, as well as two gas fields near Hammond. They produce from the Muddy and Red River formations. There have been 434 wells drilled to date in this county.

Custer County

CBNG

The Powder River RMP estimated 1.3 billion tons of sub-bituminous coal is located within Custer County. The coal occurs in the southern and southwestern portion of the county.

Conventional

The Liscom Creek and Pumpkin Creek fields are located in Custer County. Gas in these fields is produced from the Shannon formation. These fields have a small sales line in place.

Golden Valley County

CBNG

Although there is some coal shown for Golden Valley County, there are no volumes estimated. The coal that is shown is of the sub-bituminous rank.

Conventional

Two oil and two gas fields have been identified in this county, and 124 wells have been drilled to date. The wells have produced from the Cat Creek, Lakota, Niobrara, Frontier, Heath, and Tyler formations.

Musselshell County

CBNG

The RMP estimated 646.6 million tons of sub-bituminous coal in the county. These Ft. Union coals are located in the Bull Mountain Basin.

Conventional

Thirty-five fields have been identified in Musselshell County, and 1,415 wells have been drilled to date. The wells have produced from the Amsden, Cat Creek, Morrison, Heath, and Tyler formations.

Powder River County

CBNG

Based on information from the RMP, there are 27 billion tons of sub-bituminous coal in the county. The coal is located mostly in the western half of the county.

Conventional

The county has seven oil and gas fields, including Bell Creek, which is the second-largest producing field in Montana (based on cumulative production). The Shannon and Muddy formations are productive in the county, and 1,249 wells have been drilled to date.

Rosebud County

CBNG

Rosebud County contains 11.3 billion tons of sub-bituminous coal. The coal is located in the southern and eastern portion of the county.

Conventional

Rosebud County has 18 identified oil and gas fields producing from the Tyler formation, and 1,147 wells have been drilled to date.

Stillwater County

CBNG

There is one identified bituminous coal field (Stillwater) in the county and it is estimated to have 475 million tons of Eagle formation coal. The coal is estimated to contain a much higher gas content per ton than the Powder River sub-bituminous coals. The county has three gas transmission lines running through the north half of the county.

Conventional

The county has 11 identified oil and gas fields. The producing formations are the Frontier, Eagle, Claggett, Cat Creek, Morrison, and Virgelle. There have been 367 conventional wells drilled to date in the county.

Sweet Grass County

CBNG

There are no known coal reserves in the county. However, there are gas transmission lines through the center and running southeast and northeast in the county.

Conventional

One identified field—a six-shooter dome—is in Sweet Grass County. This is the Sixshooter Dome. The productive formations in the county are the Eagle and Lakota. There have been 82 conventional wells drilled to date.

Treasure County

CBNG

The RMP's coal estimates for the county from the RMP are 100 million tons. A gas transmission line runs through the southeastern part of the county.

Conventional

There are no identified oil and gas fields in the county and no productive formations have been identified; however, 32 conventional wells have been drilled to date.

Wheatland County

CBNG

No coal has been identified in Wheatland County. A gas transmission line runs through the eastern part of the county.

Conventional

One oil and gas field—Mud Creek—has been identified in the county. The Amsden formation is productive, and 60 conventional wells have been drilled to date in the county.

Yellowstone County

CBNG

Some 590 million tons of coal have been identified in the county. There are four gas transmission lines in the southern part of the county.

Conventional

Six oil and gas fields are identified in the county, and 425 conventional wells have been drilled to date. The productive formations that have been identified are the Mosser Sand, Amsden, and Dakota.

Reasonably Foreseeable Future Actions

Reasonably Foreseeable Future Actions (RFFA) address the potential developments that may occur within other jurisdictions that fall within the Billings and Powder River resource management areas. The same general assumptions and source data used for developing the RFD are applicable.

Crow Reservation

CBNG

There has been 16.1 billion tons of coal identified on the Crow Reservation.

Conventional

The reservation includes the Soap Creek, Lodge Grass, Gray Blanket, and Ash Creek oil and gas fields. There have been 172 conventional wells drilled to date on the reservation. Production occurs from the Shannon, Tensleep, Amsden and Madison formations within the reservation.

Northern Cheyenne Reservation

CBNG

Based upon limited data, it is estimated that 16.3 billion tons of sub-bituminous coal lie within the reservation. The coal is believed to underlie most or all of the reservation.

Conventional

The reservation does not have any known oil or gas fields. Twenty conventional wells have been drilled to date.

Ashland District, U.S. Forest Service

CBNG

Tertiary Ft. Union coal is believed to underlie most or all of the Ashland Forest.

REASONABLY FORESEEABLE DEVELOPMENT—ALTERNATIVE A

CBNG

A general assumption used for this alternative for CBNG wells is that the number of townships of potential development in each county would be limited to areas where coal has been identified. Additionally, other assumptions were used for Alternative A for CBNG wells. These include:

- CBNG drilling would only be allowed where there was a need for additional data (townships where no CBNG wells had been drilled by any company).
- CBNG drilling would occur but there would be no production (from federal wells). That is, the permits would be for drilling and production testing but no commercial production (with associated infrastructure).
- No permanent pipelines, power-lines, or any production facilities would be installed at any of the federal CBNG wells.
- There would be no discharge of produced water allowed from any of the federal CBNG wells.
- For a high number, four wells per township were assumed; for the low number, one well per township was assumed.
- It was assumed that the number of townships in each county would be limited to areas where coal has been identified.

BLM-Administered

An estimated 400 acres based on 400 CBNG wells would be disturbed during exploratory drilling operations (0.25 acre per location and 0.75 acre per access road) which is the number of wells predicted to be drilled during the 20-year analysis period. The total number of acres could be reduced if more than one methane well is drilled on the well pad—as is the pattern in the CX Field.

State-Administered

Existing Management Assumptions

There will be 325 CBNG wells permitted for the Redstone project area in Big Horn County. Of these, only 250 will be allowed to produce and 75 will be for exploration only. Two hundred CBNG exploration wells will be permitted for the rest of the state.

Conventional Oil and Gas

The RFD scenario from the *Oil and Gas Amendment* contains projections for the number of wells and acres disturbed in each producing region. The disturbance for each well is based on the typical depth of wells for an area. Shallow wells generally disturb fewer acres. Tables 4.1 through 4.4 in the *Oil and Gas Amendment* show totals for the planning area and each resource area. The assumptions for conventional oil and gas in this alternative are as follows:

- The unconstrained number of wells comes from the Oil and Gas Amendment RFD scenario.
- The constrained number of wells is derived from the resource analysis for wells foregone in No Surface Occupancy areas.
- The average acreage figure (total acres/total wells) for the resource area was used to estimate federal acres disturbed.
- The RFD projections have a 20-year life.
- A more detailed description of information for the assumptions is contained in the *Oil and Gas Amendment* in *Chapter 4, Social Economic Conditions* (BLM 1992), and in *Appendix C.*

BLM-Administered

The number of acres disturbed during drilling operations would be 1,342 acres based on 400 wells, which is the number of wells predicted to be drilled during the 20-year analysis period.

State of Montana

The number of acres disturbed during drilling operations would be 4,551 acres based on 891 new wells predicted for the 20-year analysis period in the Powder River and Billings RMP areas. The RFD for the State of Montana for conventional wells under this alternative is the same as Alternatives B, C, D, E, F, G and H.

Development Potential

The development potential for federal oil and gas in each county is described in the text that follows.

Big Horn County

CBNG

Based on the review of unexplored coal areas in Big Horn County, there would be 20 to 64 exploration wells drilled on minerals under BLM jurisdiction. Approximately 16 to 44 of these wells would have production potential and 4 to 20 wells would be drilled and abandoned. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for five to 30 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Carbon County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of approximately 24 to 72 wells under this alternative. Sixteen to 48 of these wells would have the potential to be productive, and 8 to 24 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

Carbon County has potential for 10 to 45 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Carter County

CBNG

No CBNG wells are projected to be drilled under this alternative in the county.

Conventional

The county has potential for 1 to 6 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Custer County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of from 20 to 64 wells under this alternative. Sixteen to 44 of these wells would have the potential to be productive; and four to 20 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Golden Valley County

CBNG

No CBNG wells are projected to be drilled in this county on minerals under BLM jurisdiction with this alternative.

Conventional

The county has potential for one to six additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Musselshell County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of 10 to 40 wells under this alternative. From eight to 30 of these wells would have the potential to be productive, and two to 10 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for 20 to 90 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Powder River County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of from 20 to 80 wells under this alternative. Sixteen to 60 of these wells would have the potential to be productive, and four to 20 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Rosebud County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of 12 to 48 wells under this alternative. Eight to 32 of these wells would have the potential to be productive, and four to 16 wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for 10 to 40 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Stillwater County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of six to 24 wells under this alternative. Four to 18 of these wells would have the potential to be productive, and two to six wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for three to 12 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Sweet Grass County

CBNG

Based on the lack of known coal reserves in the county, no CBNG wells are expected under this alternative.

Conventional

The county has potential for one to six additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Treasure County

CBNG

Based on the unexplored coal areas in Treasure County, the BLM could permit the drilling of two to four wells under this alternative. Up to two of these wells would have the potential to be productive, and up to two wells will be drilled and abandoned. There would be no pipelines or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Wheatland County

CBNG

There are no CBNG wells projected to be drilled on minerals under BLM jurisdiction in the county.

Conventional

The county has potential for one to three additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

Yellowstone County

CBNG

Based on the unexplored coal areas in the county, the BLM could permit the drilling of two to six wells under this alternative. Up to three of these wells would have the potential to be productive, and up to three wells will be drilled and abandoned. There would be no pipelines

or production facilities for these wells. The only disturbance would be for the access road and well pad.

Conventional

The county has potential for five to 15 additional wells to be drilled on minerals under BLM jurisdiction in the next 20 years, based on historical drilling rates.

RFD Conclusion

CBNG

During the life of the plan, it is estimated that the number of CBNG exploration wells that may be drilled throughout the two RMP areas would range from a low of 110 wells to a high of 400 wells on BLM-administered minerals. CBNG drilling would be allowed but there would be no production (from federal wells). This means the permits would be for drilling and testing but no production. There would be no pipelines or power-lines or any production facilities installed at any of the federal CBNG wells. There would be no discharge of produced water allowed from any of the federal CBNG wells. This would result in approximately 400 acres of disturbance for the 400 wells (0.25 acre/location and 0.75 acre/access road).

State development under this scenario would include previously approved CBNG wells at the CX Ranch and additional exploration wells. The CX Ranch could drill up to 325 wells, of which 250 could be developed for production. An additional 200 exploration well permits would be issued to operators to investigate the likelihood of CBNG development throughout the state.

Powder River RMP Area

During the life of the plan, it is estimated that the number of CBNG wells that may be drilled in the Powder River RMP area would range from a low of 60 wells to a high of 240 wells on BLM-administered minerals. CBNG drilling would be allowed but there would be no production (from federal wells). This means the permits would be for drilling and testing but no production. There would be no pipelines or power-lines or any production facilities installed at any of the federal CBNG wells. There would be no discharge of produced water allowed from any of the federal CBNG wells. This would result in approximately 240 acres of disturbance for the 240 wells (0.25 acre/location and 0.75 acre/access road).

Billings RMP Area

During the life of the plan, it is estimated that the number of CBNG wells that may be drilled throughout the Billings RMP area would range from a low of 50 wells to a high of 160 wells on BLM-administered minerals. CBNG drilling would be allowed but there would be no production from Federal wells. This means the permits would be for drilling and testing but no production. There would be no pipelines, power-lines, or any production facilities installed at any of the federal CBNG wells. There would be no discharge of produced water allowed from any of the federal CBNG wells. This would result in approximately 160 acres of disturbance for the 160 wells (0.25 acre/location and 0.75 acre/access road).

Conventional Oil and Gas

Based on the Assumptions listed at the beginning of this section, the number of conventional oil and gas wells that could be drilled on BLM administered minerals would range from a low of 60 to a high of 260 wells. No estimates of disturbance were made for conventional wells.

Powder River RMP Area

The RFD estimates that 15 to 60 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

Billings RMP Area

The RFD estimates that 45 to 200 conventional wells are to be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

Reasonably Foreseeable Future Actions—Alternative A

The RFFA predictions for Alternative A were developed using the same general assumptions as the RFD.

Forest Service—Administered

Currently, the Custer National Forest, Ashland Ranger District, is not open for oil and gas leasing. Alternative

A assumes that similar management would continue, no leases would be issued, and no wells drilled.

Crow Reservation

CBNG

Although there is a considerable amount of known coal reserves on the reservation, it is assumed that the Crow Tribe of Indians would not develop any CBNG under this alternative.

Conventional

The Reservation has potential fourteen to twenty additional wells to be drilled on Tribal minerals in the next 20 years, based on historical drilling rates.

Northern Cheyenne Reservation

CBNG

Although there is a considerable amount of known coal reserves on the reservation, it is assumed that the Northern Cheyenne Tribe would not develop any CBNG under this alternative.

Conventional

Based on historical drilling rates it would appear that no conventional oil or gas wells would be developed on the reservation under this alternative.

REASONABLY FORESEEABLE DEVELOPMENT— Alternatives B, C, D, E, F, G and H

Assumptions

CBNG

The following assumptions were used to calculate the number of wells to be drilled, the number of in-field compressors, and the number of sales compressors required:

- The coal volume for each county was taken from published sources such as the RMPs. For the RMPs, all tonnages are based on in-place coal with development potential defined as beds 5 feet thick or greater, with a 15:l or less stripping ratio, and 500 feet of overburden or less. This gives a greater tonnage than actual limits currently used by the mining industry in the area, where stripping limits seldom exceed 200 feet of overburden or a ratio of 6:l. Tonnage calculations are based on 1,770 tons/acre-foot. For the Northern Cheyenne Reservation, the coal volumes from the USGS and U.S. Bureau of Mines reports are based on very limited data. The coal volumes for the Crow Reservation from the USGS and U.S. Bureau of Mines report were based on more extensive data. The coal tonnages in the RMPs include strippable coal, which may or may not contain producible methane in economic quantities
- The gas content per ton used to calculate the quantity of gas from sub-bituminous coal was 74 standard cubic feet per ton (SCF/ton) and came from studies by the USGS (Professional Paper 1625-A). The gas content for bituminous coal used to calculate the quantity was (450 SCF/ton) and came from a paper by Campen and Gruber (1991).
- The spacing for the CBNG wells would be one well per 80 acres per coal seam. The spacing was assumed after discussions with the MBOGC, as well as our understanding that Wyoming will be using this spacing (as a general rule) for CBNG wells.
- Three coal seams would be developed per 80 acres. Another way of saying this is there would be three wells per pad in each 80 acres.
- One field compressor would service 24 CBNG wells. The area of disturbance would be 0.5 acres.
- One sales compressor could handle 10 field compressors. The area of disturbance would be 0.5 acres.
- Each CBNG well would produce .3 BCF of gas.
- Where the wells would be located in the counties was based on either the Montana Coal Occurrences from the USGS open file report OF 96-92, the RMPs, or information from the U.S. Bureau of Indian Affairs (BIA).
- No predictions were made based on distances to coal outcrops, thickness of individual coal seams, or thickness of overburden to coals. This information will be used by companies to place individual wells.
- The coal in each county did not include the coal on the Indian reservation in that specific county. The coal (from USGS and U.S. Bureau of Mines reports) on each Indian reservation resulted in a number of wells being drilled on each reservation.
- The RFD assumed that areas of lignite would not have economic production of methane so no wells were forecasted in those areas. We are not aware of any companies or individuals that are currently pursuing the testing of lignite for gas. With the present technology, it is unlikely that industry will be able to produce commercial amounts of gas from lignite within Montana, for the reasonably foreseeable future.
- The number of CBNG producing wells in each county would be approximately 90 percent of the total CBNG wells projected for that county.
- The number of CBNG dry holes would be approximately 10 percent of the total CBNG wells projected for that county.
- A 0.5-mile gathering line would be buried from the CBNG well to the field compressor. The width of disturbance would be 15 feet. Multiple flowlines would be laid in the same trench from a well pad with more than one CBNG well. Whenever possible, these lines would be placed in the access road to the wells. This would result in 0.9 acres of disturbance per line.

- There would then be steel lines going from each gathering field compressor to the sales compressor. There would be 2 miles of these steel lines per field compressor. The width of disturbance would be 25 feet. This would result in 6 acres of disturbance per line.
- The lines would go from the sales compressor to the sales lines. These would be high-pressure steel lines. There would be no more than 60 miles of these high-pressure steel lines per county. The width of disturbance would be 25 feet. This would result in 3 acres of disturbance per mile of sales line.
- The estimates for CBNG wells did not take into account variations in topography, which could have a significant impact to actual placement and numbers of wells.
- The rate of development for 20 years was based on the industry projection of October 18, 2000. The projected rate is shown in Figure MIN-4. The rate of abandonment is presented in Figure MIN-5 for the expanded development alternatives and in Figure MIN-6 for the phased development alternatives.
- For purposes of planning, the State of Montana would consider other counties, such as Blaine, Gallatin, or Park, which may have coal resources.

Conventional Wells

- Wells drilled to date in each county were taken from Dwights well data.
- The number of wells drilled to date was divided by 80 years, which is an approximation of how long exploration has been ongoing.
  - This number was multiplied by one quarter (.25), then multiplied by 20 years for the low estimate of drilling for the next 20 years.
  - The number was multiplied by 20 years to calculate a high level of drilling for the next 20 years.
- The wells drilled on each reservation were counted in the total for each county.
- The percentage of dry holes for each county is based on the overall historical percentage of non-producing wells (71 percent), compared to the total wells drilled per county.
- The acres disturbed per well will be the same as shown in alternative A.

Development Potential

The development potential for CBNG and conventional wells for all owners is described in the text that follows.

Big Horn County

CBNG

Based on the volume of coal in these areas, Big Horn County could support from 2,500 to 7,000 CBNG wells. Approximately, half of these wells (1,250 to 3,500) would be drilled on minerals under BLM jurisdiction. Producing CBNG wells would range from 2,200 to 6,300 wells. Most of the wells in Big Horn County would be in the southeastern portion of the county. There would be from 100 to 250 field compressors. The number of sales compressors estimated for Big Horn County would be from 10 to 25. This level of production would require gathering and sales lines to be constructed. From 1,450 to 4,200 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. From 200 to 500 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines. The sales lines would probably go north toward the main WBI pipeline or south to main lines in Wyoming.

Conventional

The county has potential for 50 to 200 additional wells to be drilled in the next 20 years, based on historical drilling rates. From 3 to 15 of these wells would be drilled on minerals under BLM jurisdiction.

Carbon County

CBNG

The coal in Carbon County varies from Tertiary Ft. Union (sub-bituminous) to the Cretaceous Eagle (bituminous). The Eagle coal can contain more gas per ton than the Ft. Union coals. Based on the coal volumes and gas content, 150 to 400 wells could be drilled. Thirty to 60 of these wells would be drilled on minerals under BLM jurisdiction. From 135 to 360 producing CBNG wells mostly would be located near the identified coal fields. The number of wells would

require from five to 15 field compressors and one to two sales compressors. Ninety to 240 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. Ten to 30 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. There would be no more than 60 miles of sales lines laid to the main transmission lines.

Conventional

Based on historical drilling, it is estimated that 50 to 200 wells would be drilled in the next 20 years. From 10 to 40 of these wells would be drilled on minerals under BLM jurisdiction. Some of these would be wildcat wells, but the majority would probably be associated with the existing fields.

Carter County

CBNG

CBNG wells are not predicted to be drilled in Carter County because of the nonexistence of bituminous or sub-bituminous coals.

Conventional

Based on historical drilling rates, we anticipate 25 to 100 wells to be drilled in the next 20 years. Ten to 40 of these wells would be drilled on minerals under BLM jurisdiction.

Custer County

CBNG

Based on the estimated quantity of coal, 100 to 300 wells will need to be drilled; of these, 90 to 270 would be producing wells. The CBNG development would occur in the southwestern corner of the county. Twenty to 70 of these wells would be drilled on minerals under BLM jurisdiction. This many wells would require from five to 10 field compressors and one to two sales compressors. Additional pipelines would have to be built. Sixty to 180 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Ten to 20 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines.

Conventional

Based on historical drilling rates, we estimate from 15 to 60 wells will be drilled in the next 20 years. Five to 15 of these wells would need to be drilled on minerals under BLM jurisdiction.

Golden Valley County

CBNG

No CBNG wells are anticipated to be drilled in Golden Valley County.

Conventional

Based on historical drilling activity, it is anticipated that 10 to 30 wells would be drilled in the county over the next 20 years. Most of these will probably be near the existing fields. One or two of these wells would be drilled on minerals under BLM jurisdiction.

Musselshell County

CBNG

Based on the estimates of coal in the county, it is projected that 60 to 150 wells would be drilled, and of these, there would be from 50 to 140 producing wells. Five to 20 of these wells would be drilled on minerals under BLM jurisdiction. These wells would require from two to five in-field compressors and one sales compressor. No gas sales lines run through the county. Thirty to 100 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Five to 10 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines.

Conventional

It is estimated that 100 to 350 wells will be drilled in the county in the next 20 years. Ten to 40 of these wells would be drilled on minerals under BLM jurisdiction.

Powder River County

CBNG

Based on the coals present in Powder River County, it is estimated that 2,300 to 6,700 CBNG wells could be drilled. From 1,150 to 3,350 of these wells would be

drilled on minerals under BLM jurisdiction. There would be 2,070 to 6,030 producing CBNG wells, which would require 100 to 250 field compressors, and 10 to 25 sales compressors. There is a transmission line in the southeastern part of the county but more pipelines would have to be built to gather and transport the potential gas that could be produced from this many wells. From 1,380 to 4,000 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Two hundred to 500 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. There would be no more than 60 miles of sales lines laid to the main transmission lines.

Conventional

Based on historical drilling rates, it is anticipated that 80 to 300 conventional wells would need to be drilled in the county over the next 20 years. Thirty to 100 of these wells would be drilled on minerals under BLM jurisdiction.

Rosebud County

CBNG

Based on the coal estimates for Rosebud County, the RFD projects 1,000 to 2,800 CBNG wells will be drilled. From 500 to 1,400 of these wells would be drilled on minerals under BLM jurisdiction. There would be from 900 to 2,500 producing CBNG wells, which would require approximately 40 to 100 field compressors and from five to 10 sales compressors. From 600 to 1650 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Eighty to 200 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors, and there would be no more than 60 miles of sales lines laid to the main transmission lines. There is one gas sales line that runs through the county south of Forsyth. The CBNG development would occur in the southern and eastern half of the county.

Conventional

Based on historical drilling rates in the county, the RFD projects 50 to 300 wells to be drilled over the next 20 years. Five to 50 of these wells would be drilled on minerals under BLM jurisdiction.

Stillwater County

CBNG

The RFD projects 300 to 700 CBNG wells to be drilled in the county. Fifteen to 35 of these wells would be drilled on minerals under BLM jurisdiction. These would most likely be drilled in the vicinity of the existing coal field. From 270 to 630 would be producing CBNG wells. This would require 10 to 25 field compressors and one to three sales compressors. One hundred and eighty to 420 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and follow the roads to the field compressors. Twenty to 50 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 30 miles of sales lines would be laid to the main transmission lines.

Conventional

Based on historical drilling rates, the RFD projects 25 to 100 conventional wells will be drilled in the next 20 years. Two to 5 of these wells would be drilled on minerals under BLM jurisdiction.

Sweet Grass County

CBNG

There are no known coal reserves in the county and therefore, no CBNG wells are anticipated for Sweet Grass County.

Conventional

Based on historical drilling rates, the RFD projects that five to 20 conventional wells will be drilled in the next 20 years. Up to 1 of these wells would be drilled on minerals under BLM jurisdiction.

Treasure County

CBNG

Based on the estimated coal volume in this county, the RFD projects that 10 to 25 CBNG wells could be drilled. One to 2 of these wells would be drilled on minerals under BLM jurisdiction. There would be eight to 22 producing CBNG wells, which would require 1 to 2 in-field compressors and 1 sales compressor. Five to 15 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel

routes to the wells and would follow the roads to the field compressors. One to 2 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 10 miles of sales lines would be laid to the main transmission lines.

Conventional

Based on historical drilling rates, the RFD projects one to 10 conventional wells will be drilled in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

Wheatland County

CBNG

No CBNG wells are projected to be drilled in Wheatland County.

Conventional

Based on historical drilling rates, the RFD projects five to 15 conventional wells will be drilled in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

Yellowstone County

CBNG

Based on the identified coal, there could be from 50 to 150 CBNG wells drilled in the next 20 years. One to 10 of these wells would be drilled on minerals under BLM jurisdiction. There would be 40 to 140 producing CBNG wells in the county, which would require from two to five field compressors and one sales compressor. Twenty five to 90 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. Five to 10 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 10 miles of sales lines would be laid to the main transmission lines.

Conventional

Based on historical drilling in the county, there could be from 25 to 100 wells drilled in the county in the next 20 years. None of these wells would be drilled on minerals under BLM jurisdiction.

RFD Conclusion

CBNG

During the life of the plan, it is estimated that the number of CBNG wells that may be drilled throughout the Powder River and Billings RMP Planning Areas would range from a low of 6,470 to a high of 18,225—of which 2,975 to 8,450 would be drilled on BLM-administered minerals. There would be from 5,800 to 16,400 producing CBNG wells, of which 2,500 to 7,500 would be BLM administered. For a graphical presentation of these predictions, refer to Map 4-1 in Chapter 4 of this EIS. Table MIN-1 at the end of this section presents the RFD Expanded Development Scenario in numerical form.

These wells would require 250 to 700 field compressors, and 25 to 70 sales compressors. From 3,900 to 11,200 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. Five hundred to 1,400 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors, and approximately 480 miles of sales lines would be laid to the main transmission lines. This would result in 22,500 to 74,000 acres of disturbance.

Powder River RMP Area

During the next 20 years, it is estimated that the number of CBNG wells that may be drilled throughout the Powder River RMP area, would range from a low of 5,400 to a high of 15,600. The number of wells drilled each year would range from 200 to 1,100. There also would be 4,800 to 13,400 producing CBNG wells, which would require 200 to 550 field compressors and 20 to 55 sales compressors. From 3,200 to 8,900 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. From 400 to 1,100 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. Approximately 290 miles of sales lines would be laid to the main transmission lines. This would result in 24,400 to 73,600 acres of disturbance.

Billings RMP Area

During the next 20 years, it is estimated that the number of CBNG wells that may be drilled throughout the Billings RMP area, would range from 1,100 to

2,600. There would be 100 to 2,350 producing CBNG wells, which would require 5 to 100 field compressors and 1 to 10 sales compressors. One hundred to 1,600 miles of plastic, low-pressure gathering lines needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. From 10 to 200 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. Approximately 170 miles of sales lines would be laid to the main transmission lines. This would result in 350 to 18,400 acres of disturbance.

Conventional Oil and Gas

Based on the assumptions listed at the beginning of this section, the number of conventional oil and gas wells that could be drilled would range from 450 to 1,775. The number of wells drilled each year would range from two to seven in each of the 13 counties if the wells were distributed equally among the counties. No estimates of disturbance were made for conventional wells.

Powder River RMP Area

The RFD estimates that 200 to 800 conventional wells would be drilled in the next 20 years in the Powder River RMP area. Seventy to 300 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

Billings RMP Area

The RFD estimates that 250 to 975 conventional wells would be drilled in the next 20 years in the Billings RMP area. Twenty-five to 100 of these wells would be drilled on minerals under BLM jurisdiction. Most of these wells would be drilled in or near the existing fields.

Reasonably Foreseeable Future Actions—Alternatives B, C, D, E, F, G, and H

The RFFA predictions for Alternative B, C, D, E, F, G and H were developed using the same general assumptions as the RFD. However, the coal tonnages for the Indian reservations are based on the thickest coals (coals over 20 feet thick).

Development Potential

The development potential for CBNG and conventional wells for all owners on the Crow Reservation, Northern Cheyenne Reservation and the Custer National Forest is described in the text that follows.

Ashland District, U.S. Forest Service

CBNG

Coal resources are primarily concentrated in the southern portion of the district. Otter Creek and the Tongue River drainages have eroded or exposed many of the coal zones. Based on the coal resources, the RFFA predicts that approximately 200 wells may be drilled over 20 years. This would result in approximately 400 acres of long-term disturbance.

Crow Reservation

CBNG

Based on the identified coal resources within the reservation, 1,400 to 4,000 CBNG wells could be drilled; of these, 1,300 to 3,600 would be producing wells. The wells would probably be located in the eastern portion of the Crow Reservation. This would require from 50 to 150 field compressors and from five to 15 sales compressors. Eight hundred to 2,400 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. One hundred to 300 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. No more than 60 miles of sales lines would be laid to the main transmission lines. This would result in 7,000 to 12,000 acres of disturbance.

Conventional

Based on historical drilling rates, 10 to 50 conventional wells could be drilled in the next 20 years.

Northern Cheyenne Reservation

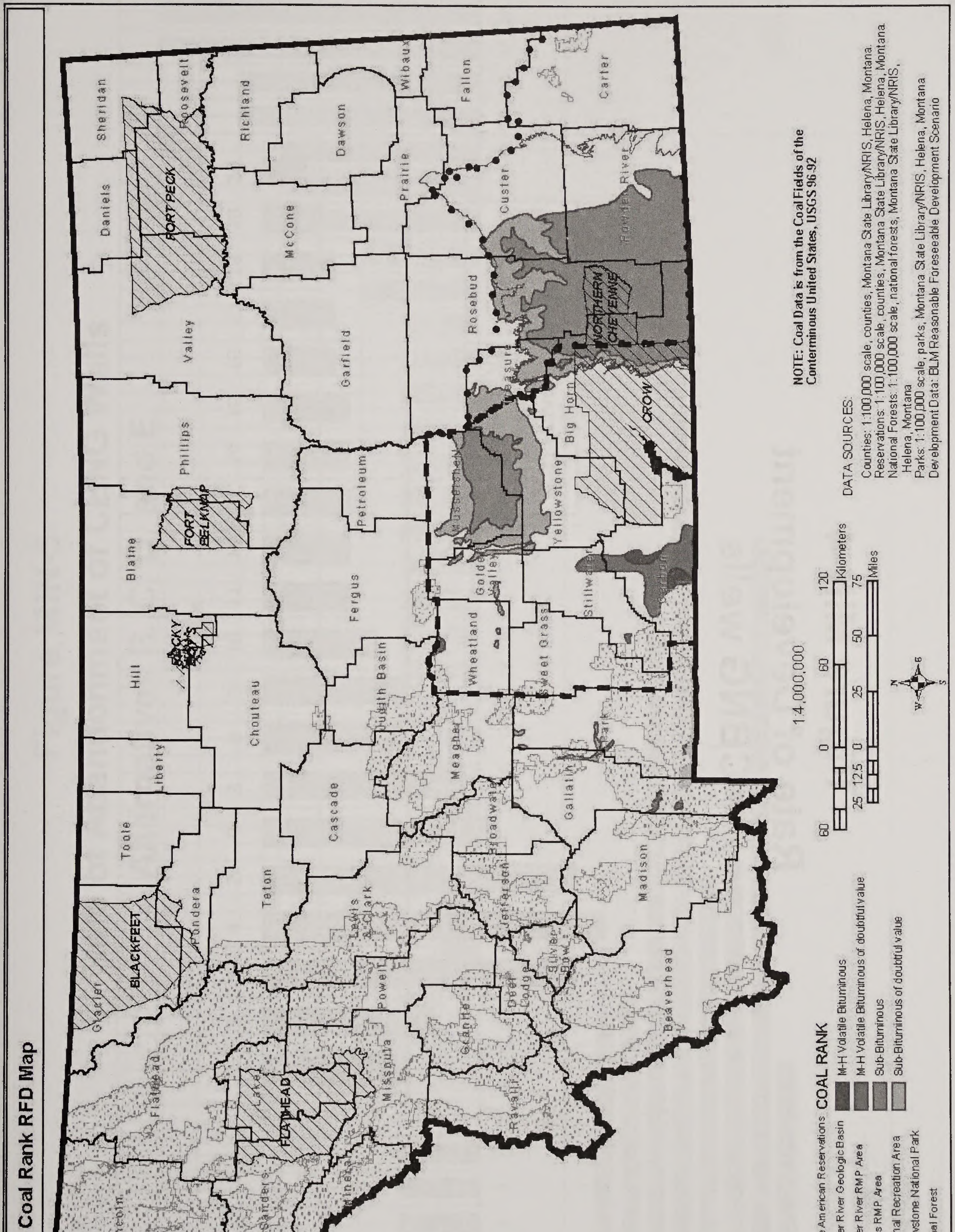
CBNG

Based on coal resources, 1,400 to 4,000 CBNG wells could be drilled on the reservation; of these, there would be 1,300 to 3,600 producing wells. The wells would most likely be located along the southern boarder of the reservation and extend from the western to the eastern boundaries. This would require 50 to 150

field compressors, and from five to 15 sales compressors. Eight hundred to 2,400 miles of plastic, low-pressure gathering lines would be needed. These lines would be laid in the travel routes to the wells and would follow the roads to the field compressors. From 100 to 300 miles of low-pressure steel lines would be laid from the field compressors to the sales compressors. There would be no more than 60 miles of sales lines laid to the main transmission lines. This would result in 7,000 to 12,000 acres of disturbance.

Conventional

Based on historical drilling rates, one to five conventional wells could be drilled on the reservation in the next 20 years.


MIN-1: Coal Rank RFD Map
NOTE: Coal Data is from the Coal Fields of the Conterminous United States, USGS 96-92
DATA SOURCES:
Counties: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana.
Reservations: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana
National Forests: 1:100,000 scale, national forests, Montana State Library/NRIS, Helena, Montana
Parks: 1:100,000 scale, parks, Montana State Library/NRIS, Helena, Montana
Development Data: BLM Reasonable Foreseeable Development Scenario
1:4,000,000
60 0 60 120 Kilometers
25 12.5 0 25 50 75 Miles
Native American Reservations
Powder River Geologic Basin
Powder River RMP Area
Billings RMP Area
National Recreation Area
Yellowstone National Park
National Forest
COAL RANK
M-H Volatile Bituminous
M-H Volatile Bituminous of doubtful value
Sub-Bituminous
Sub-Bituminous of doubtful value
Sheridan
Daniels
Roosevelt
Richland
Dawson
Wibaux
Fallon
Carter
Prairie
McCone
Custer
Powder River
Rosebud
Garfield
Valley
Phillips
Petroleum
Blaine
Hill
Liberty
Toole
Glacier
Pondera
Teton
Chouteau
Cascade
Fergus
Judith Basin
Wheatland
Golden Valley
Musselshell
Yellowstone
Big Horn
Treasure
Stillwater
Carbon
Sweet Grass
Park
Gallatin
Meagher
Broadwater
Jefferson
Lewis & Clark
Powell
Granite
Deer Lodge
Silver Bow
Madison
Beaverhead
Ravalli
Missoula
Mineral
Sanders
Lincoln
Flathead
Lake
FORT PECK
FORT BELKNAP
ROCKY BOY'S
BLACKFEET
FLATHEAD
NORTHERN CHEYENNE
CROW

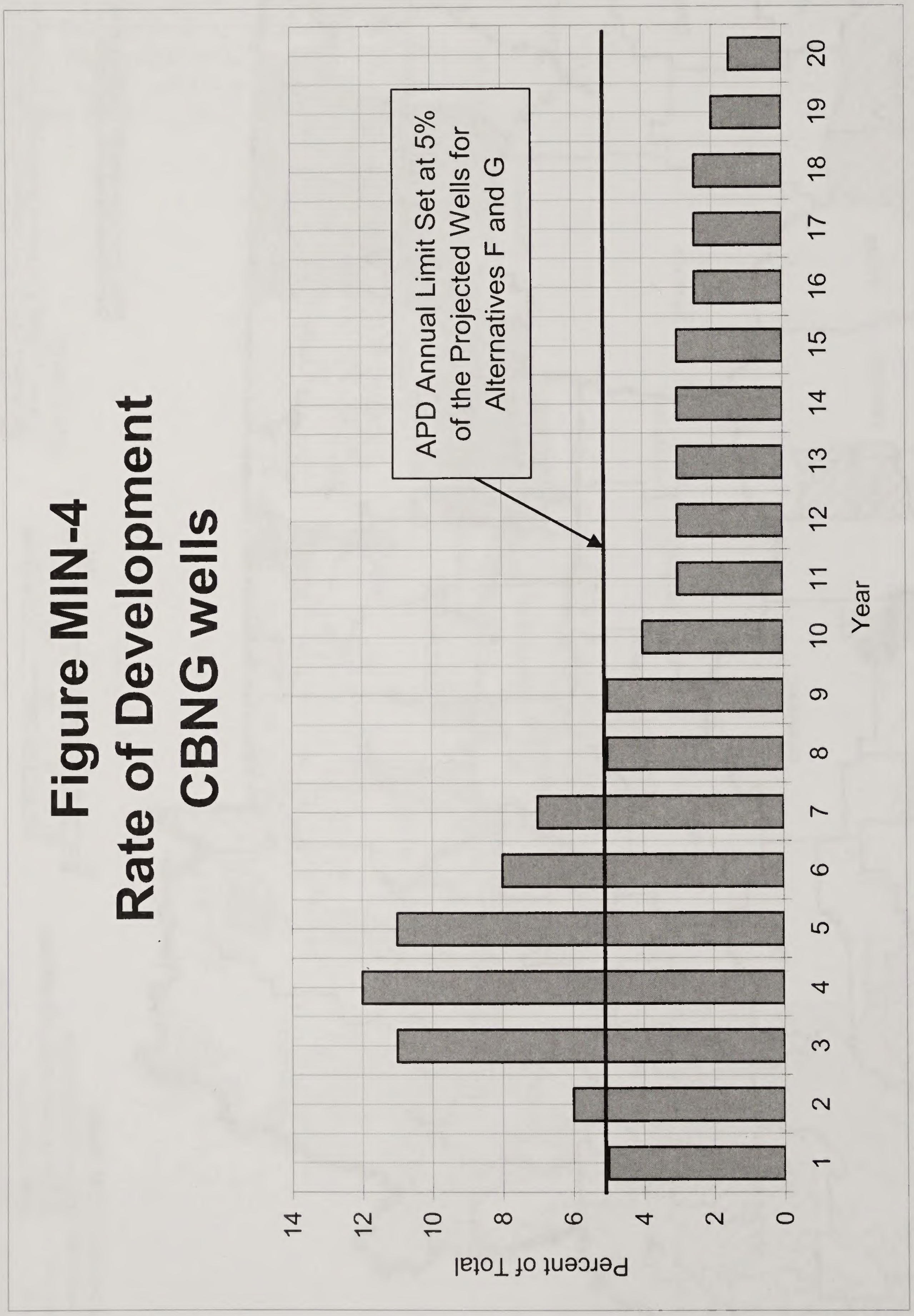
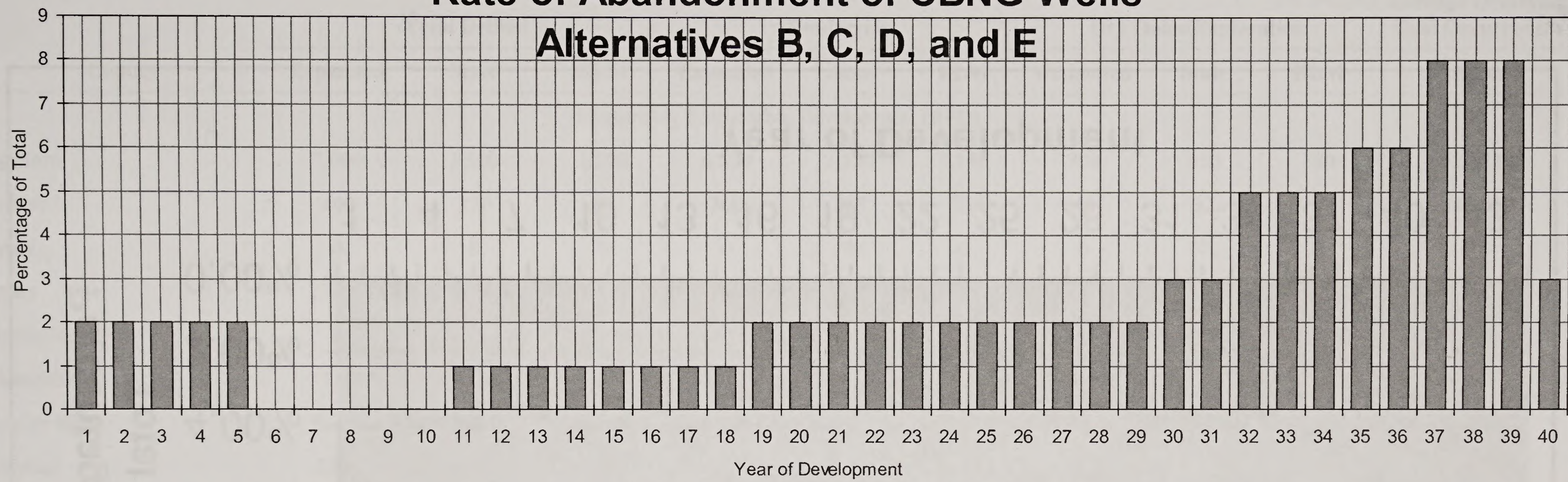


Figure MIN-4
Rate of Development
CBNG wells
APD Annual Limit Set at 5%
of the Projected Wells for
Alternatives F and G
Percent of Total
0
2
4
6
8
10
12
14
Year
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Figure MIN-5
Rate of Abandonment of CBNG Wells
Alternatives B, C, D, and E



1) Wells will be drilled over a 20 year period.
2) Wells may have a productive life of 20 years.
3) A well drilled in the 20th year with a productive life of 20 years would be plugged in the 40th year.
4) Initially (years 1-5) some wells will be P&A (1%-2%) while defining the productive areas this accounts for increased dry holes.
5) During years 6-10 most of the wells drilled will be productive.
6) After 10 years some wells will start to be P&A due to declining production.
7) The majority of the abandonment will occur in the last few years, as field production declines to uneconomic.
8) After 40 years all wells will be P&A.

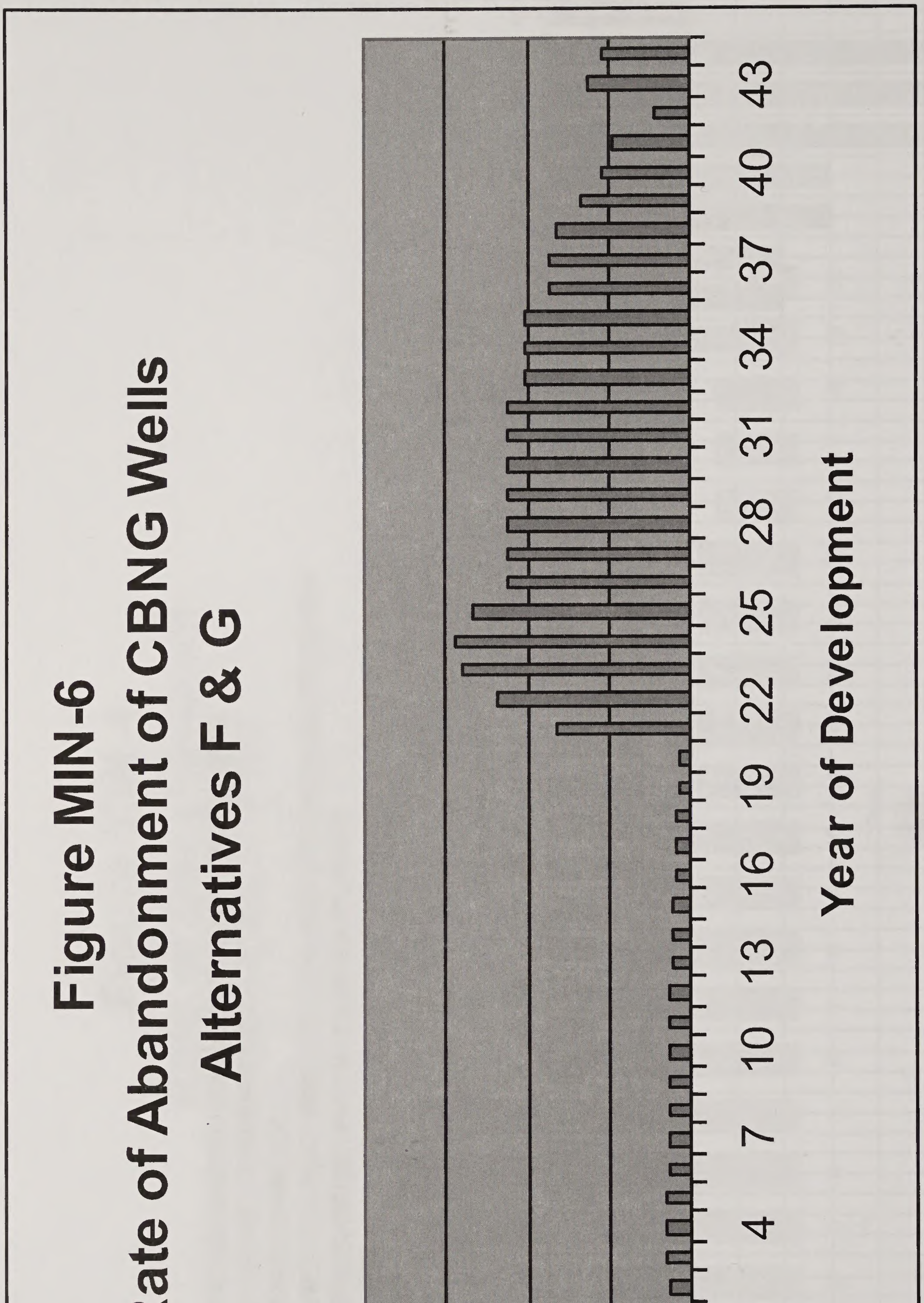


Figure MIN-6
Rate of Abandonment of CBNG Wells
Alternatives F & G
Percentage of Total
8.00%
6.00%
4.00%
2.00%
0.00%
1
4
7
10
13
16
19
22
25
28
31
34
37
40
43
Year of Development

TABLE MIN-1
RFD/RFFA NUMERICAL PREDICTIONS FOR EXPANDED CBNG DEVELOPMENT SCENARIO

County	Total Drilled			Production			Dry Holes/Exploration			Acreage Overlying Coal Occurrences
	Expanded	State	BLM	Expanded	State	BLM	Expanded	State	BLM	Acres
Reasonably Foreseeable Development (RFD)										
Big Horn	7,000	3,500	3,500	6,300	3,150	3,150	700	350	350	524,738
Carbon	400	320	80	360	288	72	40	32	8	448,000
Carter	0	0	0	0	0	0	0	0	0	0
Custer	300	230	70	270	207	63	30	23	7	418,000
Golden Valley	0	0	0	0	0	0	0	0	0	0
Musselshell	150	130	20	135	117	18	15	13	2	764,000
Powder River	6,700	3,350	3,350	6,030	3,015	3,015	670	335	335	713,500
Rosebud	2,800	1,400	1,400	2,520	1,260	1,260	280	140	140	1,005,500
Stillwater	700	665	35	630	599	32	70	67	4	65,500
Sweetgrass	0	0	0	0	0	0	0	0	0	0
Treasure	25	24	1	23	22	1	3	2	0	153,500
Wheatland	0	0	0	0	0	0	0	0	0	0
Yellowstone	150	140	10	135	126	9	15	14	1	678,000
Total RFD	18,225	9,759	8,466	16,401	8,782	7,619	1,821	975	847	4,770,738

TABLE MIN-1
RFD/RFFA NUMERICAL PREDICTIONS FOR EXPANDED CBNG DEVELOPMENT SCENARIO

County	Total Drilled			Production			Dry Holes/Exploration			Acreage Overlying Coal Occurrences
	Expanded	State	BLM	Expanded	State	BLM	Expanded	State	BLM	Acres
Reasonably Foreseeable Future Actions (RFFA)										
Northern Cheyenne	4,000	0	0	3,600	0	0	400	0	0	445,000
Crow	4,000	0	0	3,600	0	0	400	0	0	332,000
Forest Service	200	0	0	180	0	0	20	0	0	501,500
Total RFFA	**8,200**	**0**	**0**	**7,380**	**0**	**0**	**820**	**0**	**0**	**1,278,500**
Total RFD and RFFA	**26,425**	**9,759**	**8,466**	**23,781**	**8,782**	**7,619**	**2,641**	**975**	**847**	**6,049,238**
Powder River RMP	15,635	7,899	7,716	14,071	7,109	6,944	1,563	790	772	2,726,033
Billings RMP	2,590	1,860	750	2,330	1,673	675	258	185	75	2,044,705
RFD Totals	**18,225**	**9,759**	**8,466**	**16,401**	**8,782**	**7,619**	**1,821**	**975**	**847**	**4,770,738**
	Big Horn County		**Drilled**	**Production**	**Dry Holes**					
Powder River RMP	83.00%		5810	5229	581					
Billings RMP	17.00%		1190	1071	119					

Note: Percentages indicate portion of Big Horn county overlying known coal occurrence within each RMP excluding the Crow Reservation lands.

Note: The adjustment of numbers in Table MIN-1 is due to the SEIS Planning Area consisting of the Billings and Powder River RMP Areas which do not include Park, Gallatin, and Blaine Counties which were included in the 2003 Statewide FEIS.

CUMULATIVE PROJECTS EVALUATED

Compliance with the National Environmental Protection Act (NEPA) requires analysis of cumulative effects for each alternative. Cumulative effects on the environment are those that result from the incremental impacts of an alternative when added to the other past, present and reasonably anticipated future actions, regardless of who undertakes those actions. In analyzing cumulative effects from this project, it will be important to understand the incremental impacts from other past, present, and future actions planned for the RMP areas. However, not every project can be included in the analysis or the result could become cumbersome; thus, providing decision makers with extraneous information. Therefore, the importance of scoping cannot be overstressed because it provides the initial opportunity to identify boundaries for a meaningful analysis. The cumulative effects study approach is defined by discussing the Study Area Delineation (spatial boundary); past, present, and future projects that meet a minimum criteria of magnitude as to add to the cumulative effect and time frame for the analysis and is discussed in the conclusions section of each alternative.

Study Area Delineation

The planning area for BLM is the Billings RMP area (10,791,964 acres) and the Powder River RMP area (8,567,125 acres). Acre estimates are for all land within the RMP's regardless of ownership, federal, state or private.

The planning area proposed for the supplemental environmental impact statement (SEIS) RMP is exceptionally large and limits the type of analyses that can be included in the subject analysis. It is important to note that the objective of the cumulative analysis is not to perform the perfect analysis, but to select projects that would be appropriate to the subject analysis and aid in the selection of a preferred alternative. With this in mind, the objective is not to make an attempt to choose all projects throughout the entire state of Montana that might add to the cumulative effect of the BLM's action. This extreme is simply not practical; however, if the thought is more focused, cumulative impact analysis could be chosen on a practical level. Cumulative impacts that might affect other resources are not considered as regionally extensive, the projects/activities to consider may be different. For example, groundwater impacts would be limited to the general area of CBNG production. This would also be the case with soils, agriculture and grazing, cultural and paleontological resources, geology and minerals, Indian trust assets, socioeconomics, and others. Other than air quality related impacts (including visual) and surface and ground water influences from Wyoming CBNG development, BLM believes the proposed study area is appropriate for this plan and is consistent with other BLM plans. Using this approach, combined with the general knowledge of the area, consideration of a study area that is essentially the Powder River Basin is appropriate. We are, however, limited to some extent in what can be considered and must strive to choose those areas and projects and activities that are truly applicable to the process.

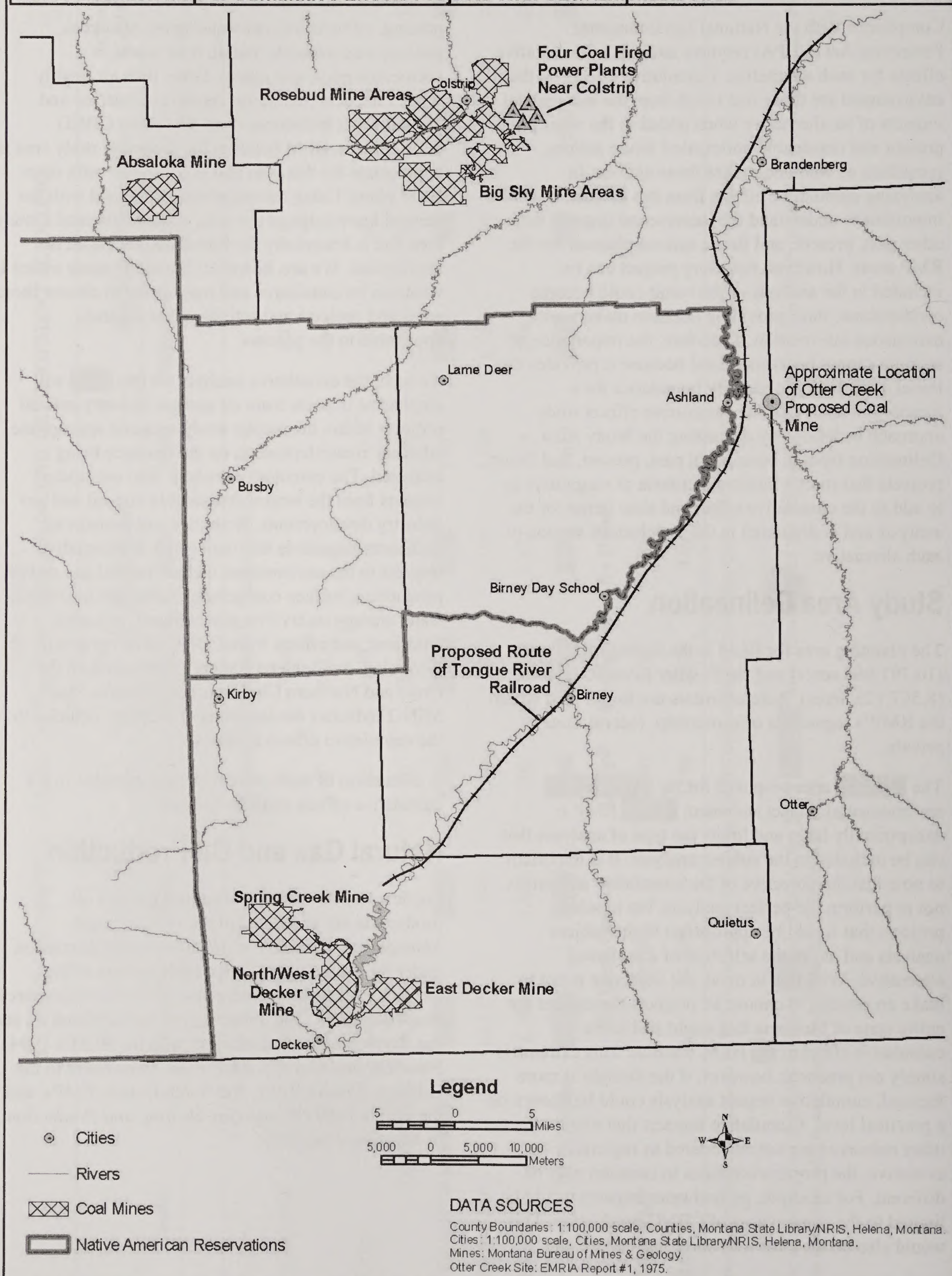
As such, the cumulative analysis for this SEIS will emphasize impacts from oil and gas industry-related projects within the project study area and appropriate adjacent areas, depending on the resource being analyzed. The cumulative analysis also considered impacts from the largest foreseeable non-oil and gas industry developments. Activities and projects of sufficient magnitude that may result in cumulative impacts to the environment include natural gas and oil production; surface coal mining; railroads; highways; water storage reservoirs; power plants; potential wildfires; and effects from CBNG development in Wyoming, the Ashland Ranger District and on the Crow and Northern Cheyenne reservations. Map MIN-2 indicates the locations of projects included in the cumulative effects analysis.

A discussion of each project or type included in the cumulative effects analysis follows.

Natural Gas and Oil Production

Impacts from conventional natural gas and oil production are addressed in the *Impacts from Management Common to All Alternatives* discussion under the individual resource topic section of the *Impacts From Management Specific to Each Resource and Alternative*. The impacts from conventional oil and gas development are consistent with the BLM's 1994 *Final Oil and Gas EIS RMP Plan Amendment* to the Billings, Powder River, and South Dakota RMPs, and the state's 1989 *Oil and Gas Drilling and Production in Montana Final EIS*.

MIN-2: Location Map of Cumulative Effects Projects With CBM Emphasis Area



Surface Coal Mining

Several mines are present in and around the CBNG planning area. They include operating mines, mines undergoing expansion, reclamation of older mines, and future planned mines. Mines that are generally located within the Powder River Basin and have a potential to add to the cumulative impact include the Spring Creek, Decker, Big Sky, Rosebud, and Absaloka. These mines are located in three general areas: the Spring Creek and Decker mines are in southeast portion of Big Horn County just east of the Crow Reservation; the Absaloka mine is located just outside the northeastern corner of the Crow Reservation in Big Horn County; and the Rosebud and Big Sky mines are located near Colstrip, Montana, just north of the Northern Cheyenne Reservation. Table MIN-2 shows the annual production (2004) of each mine in the planning area along with environmental data for permitted acres, disturbed acres, and backfilled and re-topsoiled acres.

In addition to the quantities identified in the Table MIN-2, the BLM has been conducting a coal screening to identify additional lands that may be suitable for leasing over the next 20 years. Currently, the study has identified lands immediately adjacent to the existing mines. These newly-identified potential lease areas amount to approximately 16,000 acres. Approximately 41,810 acres remain to be disturbed by mining operations during the next 20 years. This estimate is based on current activities and foreseen future developments.

Based on the analysis conducted for this study, it is estimated that the current (2003) production of 36.1 mmtpy of coal in the Montana PRB study area would increase to 56.0 mmtpy under the lower production scenario and to 83.0 mmtpy under the upper production scenario by 2020. Production at currently operating mines is projected to continue throughout the study period. In addition, three potential new developments (i.e., P&M Ash Creek Mine, Otter Creek Mine, and Kinsey Mine) have been identified in the Montana PRB study area. Under the lower production scenario, it is projected that production at the P&M Ash Creek Mine would be initiated by 2010; the Otter Creek and Kinsey mines would not be developed. Under the upper production scenario, it is projected that production would be initiated by 2010 at both the Otter Creek and P&M Ash Creek mines and by 2015 at the Kinsey Mine. Development of these mines would be dependent on markets for the coal and may be tied to development of infrastructure including the Tongue River Railroad and/or power plants. It is assumed that development of the Otter Creek Mine would require construction of Tongue River Rail Company's (TRRC's) proposed Tongue River Railroad and a power plant near Miles City, Montana. However, at this time, no application has been filed for a new power plant at this location. It is assumed that the Kinsey Mine would be developed in response to construction of a mine-mouth power plant; however, an application for a new power plant at this location has not been filed at this time.

Surface water quality within the vicinity of the coal mines is impacted by increased sediment load resulting from increased erosion during mining. This is mitigated by the use of sediment settling ponds and the vegetating of overburden and topsoil storage areas. The discharge of groundwater pumped from mine pits may also affect surface water depending on the quality of groundwater within the mine vicinity and the quantity of groundwater discharged. Much of the groundwater pumped from the mine pits is stored and used to control dust on roads, truck and train car loading areas, and the mine face. In some instances, mining activities require the diversion of streams or drainage areas that are within the area to be mined. Approximate original topography, including stream channels and drainage areas, are restored during mine reclamation activities. All mines are required to monitor their discharges and obtain Montana Pollution Discharge Elimination System permits. The majority of discharges are related to storm responses with the exception of the Decker mines, which has a permit for a regular discharge of 4.5 cubic feet per second into the Tongue River.
Impacts to groundwater resources resulting from surface coal mine activities are usually related to drawdown and quality issues from backfilled spoils. Coal beds are among the most dependable and utilized aquifers in

TABLE MIN-2
SURFACE MINES WITHIN THE CBNG PLANNING AREA

Mine	Annual Production 2004 (Short Tons)[1]	Permitted Surface Acres	Disturbed Acres	Backfilled and Re-topsoiled Acres
Spring Creek	12,068,328	6,700	3,000	550
Decker (North/West and East)	8,241,467	11,400	6,921	1,966
Big Sky (Area A&B)	2,850,000	8,100	3,600	2,600
Rosebud (Areas A, B, C, D, and E)	12,664,823	26,400	15,255	6,969
Absaloka	6,474,339	5,400	3,714	2,563
Total	42,298,957	58,300	32,490	14,648

Note: This table shows the cumulative disturbances and reclamation efforts associated with each of the surface mining operations within the CBNG planning area.
[1]Energy Information Administration, Annual Coal Report, 2004, DOE/EIA-0584(2004) (Washington, DC, September 2005). http://www.eia.doe.gov/cneaf/coal/page/acr/table9.html

eastern Montana, because of their fracture-related transmissivity and lateral continuity. Adjacent portions of these aquifers discharge water into the mining pit, which requires that it be pumped-off resulting in the lowering of the water levels within aquifers adjacent to the mine. The area affected and the distance from the mine affected depends on the particular aquifer characteristics of the area, presence of faults, rates of surface water and precipitation recharge, and other factors, and will vary depending on the location of the mine. Groundwater wells, springs, and surface streams within the area can be impacted by the lowered water levels. Those located nearest the mine experience the greatest impact. In the mining areas near Colstrip and Decker, coal aquifers have shown drawdown as much as 75 feet and a radius of impact up to 4 miles (Wheaton and Metesh 2001). The resulting total area of groundwater impact from coal mines is calculated to be 366,000 acres. The rate at which water levels recover varies between mining regions, but normally requires more than 20 years (Wheaton and Van Voast 1998).

Overburden replaced in the mine pits during reclamation is approximately inverted from its original orientation. The mineral content of these near-surface unsaturated and weathered rock layers used in typical overburden affect the groundwater quality within the area of the reclaimed mines. The resulting poor water quality is present for many years after mining is completed. Elevated levels of sodium, magnesium, calcium, bicarbonate, chlorides, and sulfates are possible, as well as increased total dissolved solids (TDS). Dissolution of these salts causes increases in TDS concentrations in the spoils aquifers that have been observed at levels 50 percent to 200 percent greater than the adjacent bedrock aquifers (Wheaton and Van Voast 1998). With time, some sites return to pre-mining quality; however, the impacts to water quality may be everlasting at other sites where soluble salts are continuously generated by weathering and oxidation.

Coal Mine Impacts on Air Quality

Coal mines have an effect on air quality within the region surrounding the surface operations. Air pollutant emissions data are available for five surface coal mines within the planning area; three are in Big Horn County (Absaloka, Spring Creek, and Decker mines), and two are in Rosebud County (Big Sky and Rosebud mines). Table MIN-3 shows the average air pollutant emissions from the mines within the planning area. Volatile organic compounds (VOCs) shown in the table would also include any fugitive methane vented from the mines. Future impacts also would be realized from opening new mines, expanding existing mines, and installing power generation plants at existing coal mines. Wyoming mines would also have an effect on Montana's air quality. Emission sources for these mines as considered in the air quality model have been included in the Air Model Appendix.

TABLE MIN-3
AVERAGE AIR POLLUTANT EMISSIONS FROM SURFACE MINES WITHIN THE PLANNING AREA (TONS/YEAR)

Source	PM_{10}[1]	CO[2]	NO_2[3]	SO_2[4]	VOCs[5]
Existing Coal Mines (5)—Avg/Mine	412.1	323.4	290.2	56.5	18.8

Notes: This table summarizes the impacts to air quality from surface mining sources within the planning area (MDEQ—1999 Air Quality Monitoring Data). Values were obtained from 1999 Toxic Release Inventory for the State of Montana.

[1] PM_{10}—Particulate matter that is less than or equal to 10 microns in size.

[2] CO—Carbon monoxide

[3] NO_2—Nitrous oxides

[4] SO_2—Sulfur dioxide

[5] VOCs—Volatile organic compounds

Highways

There are no current proposals for new highways within the CBNG planning area. It is assumed that several secondary highways, state routes, and county roads will undergo some form of repair, resurfacing, widening, or extension during the course of CBNG development. Currently, a list of proposed road improvements within the CBNG planning area is not available for analysis and quantification. These activities, however, would subject the adjacent lands to impacts associated with linear construction and surface disturbances. For the purposes of this analysis, we are assuming that 250 miles of existing road would be improved over the next 20 years.

Water Storage Reservoirs

The Tongue River flows about 100 miles from its headwaters in Wyoming's Bighorn Mountains to the Tongue River Reservoir. The reservoir is approximately 8 miles long and 1 mile wide, with an average depth of 20 feet, and was completed in 1940. Water leaving the north end of the reservoir flows about 190 miles, northeasterly, until it reaches its confluence with the Yellowstone River at Miles City.

The reservoir was enlarged in 1999, at the request of the Department of Natural Resources and Conservation (DNRC), Northern Cheyenne Tribe, and the U.S. Bureau of Reclamation. The enlargement included the reconstruction of the dam and disturbance of 157 acres. The disturbance included aggregate mining, roads, staging areas, and railroad layout areas, some of which have been reclaimed. As a result of the enlargement, the reservoir capacity was increased by 13,000 acre-feet, the surface water level raised by 4 feet, and the surface area expanded by some 400 acres to nearly 3,615 acres.

Power Generation Plants

Five existing power generation plants are located within the CBNG planning area, and all are coal-fired. Four are located in Rosebud County near the coal mine area and one is located in Billings. The resource area most affected by the burning of coal to produce electrical power is air quality. Air quality data from all five power generation plants are available. Table MIN-4 summarizes the impacts to air quality from these plants within the planning area, according to the MDEQ 1999 Air Quality Monitoring Data.

Hardin Generating Station

The Hardin Generating Station has been permitted, constructed, and is operating as a direct combustion facility. The 116-megawatt coal-fired plant was retrofitted into an existing manufacturing facility, resulting in reduced surface disturbances and no new power lines were needed to move the power. The air quality permit was issued to Rocky Mountain Power for the Hardin Generating Station, however, the project ownership has changed hands, and is now backed by MDU Resources Group, an affiliate of the Montana-Dakota Utilities. The permit was issued by the Montana Department of Environmental Quality in December 2004.

Coal to fuel the plants comes from the nearby Absaloka coal mine operated by Westmoreland. The power plant will burn an estimated 650,000 tons annually. The electricity was contracted by a subsidiary of BC Hydro of Vancouver, British Columbia, the third-largest electrical utility in Canada.

A good source of water comes from the Bighorn River which flows nearby but there is zero discharge of water back into the river as the plant was designed with a closed internal system. The Hardin project is the first plant in the state to install technology to control mercury emissions and will be "state of the art" in pollution control. The technology the plant employs will be a test site for mercury controls during its first three years of operation. Before the three-year period expires, the company must install a technology known as activated carbon injection or a similar technology approved by the Montana Department of Environmental Quality.

Additional information regarding the Hardin Generating Station, such as estimated emission levels, is available in the Air Quality appendix.

Roundup Power Plant

Another power plant project considered in the air quality analysis is the Roundup project proposed by the Bull Mountain Development Company, No. 1, LLC (Bull Mountain). They propose to build a coal-fired electricity generation plant, called the Roundup Power Project, and related facilities on a 208-acre site about 13 miles south-southeast of Roundup, Montana, in Musselshell County. The plant would consist of two steam turbine generating units each burning pulverized coal. The nominal generation capacity would be 780 megawatts.

The boilers would be fueled with coal from the nearby Bull Mountain Mine. Coal would be transported from the mine to the power plant via a 4,000- foot-long conveyor. Power generated by the plant would be transmitted via a 28.2- mile 161kV transmission system, consisting of three circuits, to the Broadview Substation. Boiler water would be supplied by wells drilled into the Madison Formation.

In January, 2003, the DEQ issued a Clean Air Act permit to Bull Mountain Development Corp. for this new plant. However, on July 13, 2005, the DEQ informed Bull Mountain Development Corp. that their air quality permit had expired and a new one must be obtained before construction of the power plants can proceed. The DEQ has offered to extend the permit, if the corporation agrees to additional stipulations for toxic air emissions.

A coal-fired power plant proposed for east of Great Falls by Southern Montana Electric Generation and Transmission Cooperative received a draft air-quality permit from the DEQ. The city of Great Falls joined five rural electric cooperatives in proposing the Highwood Generating Station. The technology planned at the Highwood plant is called circulating fluidized bed combustion. The new technology produces less mercury, sulfur dioxide and other toxic emissions. The plant would generate 250 megawatts and is scheduled to be built by 2008 on a site 8 miles east on the south side of the Missouri River. The plant will burn approximately 1,100,000 tons of coal yearly.

Other power plants maybe envisioned due to the electrical industry's deregulation and the increased demand nation wide. Some of these plants may find it advantageous to locate in Montana near a source of coal or natural gas; however, no new plants were presented to the DEQ for permitting at the time of the 2003 Statewide FEIS.

Wildfires

The BLM Fire Management Program suppresses wildfires and uses prescribed fires to achieve land management objectives. Nationally, 63 percent of wildfires are caused by lighting and the remaining 37 percent by human activities. The average wildfire consumes approximately 370 acres, but the acreage can more than double in severe years that have drought, high winds, or above normal lightning.

Prescribed fires are carefully planned to remove old, woody vegetation, prepare areas for reseeding, or reduce the natural accumulation of dead vegetation. They make room for growth of more nourishing forage for livestock and wildlife, and are often designed to burn a mosaic pattern, leaving patches to serve as cover for some wildlife species. The average prescribed fire covers 150 acres of land. Based on previous RMPs, it is estimated that 25 wildfires would occur per year in the planning area. The fires would range in size from 1/4 acre to 1,000 acres. Surface disturbances caused from fire lines would average 3 acres per fire or a total of 75 acres per year.

TABLE MIN-4
AVERAGE AIR POLLUTANT EMISSIONS FROM FIVE MAJOR SOURCES WITHIN THE PLANNING AREA
(TONS/YEAR)

Source	PM_{10}[1]	CO[2]	NO_2[3]	SO_2[4]	VOCs[5]
Existing Power Plants (5)—Avg/Plant	1534.1	578.9	7977.1	5339.4	69.8

Note: Values were obtained from the EPA Critical Air Pollutants 2001 for the State of Montana.
http://www.epa.gov/air/data/emcatbar.html?st~MT~Montana

1PM10—Particulate matter that is less than or equal to 10 microns in size

2CO—Carbon monoxide

3NO2—Nitrous oxides

4SO2—Sulfur dioxide

5VOCs—Volatile organic compounds

Wyoming CBNG Production

CBNG production in Wyoming is concentrated in the Powder River Basin. CBNG resources of the Powder River Basin are more extensively developed in Wyoming than in Montana. Most of the surface area of the basin is located in Wyoming, with 92 percent of the coal volume located in the Powder River basin lying within Wyoming (Ellis et al., 1999a). The CBNG development in Wyoming has the potential to impact water resources in Montana through the drawdown of groundwater within coal seam aquifers that extend from Wyoming north into Montana and by the discharge of CBNG-produced waters in Wyoming to surface waters that flow north into Montana. The potential magnitude of the impact to Montana water resources from Wyoming CBNG production is tied to the RFD of CBNG in Wyoming. Projections for the RFD of CBNG in the Wyoming portion of the Powder River basin adjacent to Montana have been the subject of recent BLM reports.

CBNG development in Wyoming has the potential to cause substantial impacts in Montana to surface water quality and groundwater resources. The Wyoming DEQ and the Montana DEQ have adopted an interim memorandum of cooperation on limiting discharge to watersheds that extend into Montana, the probability of future agreements is tentative.

The *Coalbed Methane Project Final EIS (Wyodak EIS)* (BLM 1999b) projected 6,000 CBNG wells in the Buffalo Field Office Area. The water model, done as part of the EIS, estimated an average production rate of 12 gpm per CBNG well. This level of development was estimated to result in an increase of approximately 1.1 percent (452 cfs to 457 cfs) in the average flow volume of the Powder River at Moorhead, Montana (BLM 1999b), and an increase of approximately 50 percent (22 cfs to 33 cfs) in the average flow volume in the Little Powder River at the Weston station, which is located approximately 20 miles south of the Wyoming/Montana border. These increases are based on yearly averages. However, during low-flow periods, the Powder River flow volume could be increased by more than 800 percent as a result of the discharge of CBNG-produced waters. Flow volumes in the Little Powder River would consist entirely of discharged CBNG-produced waters (BLM 2001b).

The quality of CBNG produced water from individual wells in the Wyoming portion of the PRB shows considerable variability (Rice et al, 2000); water quality parameters such as SAR vary from approximately 5 to over 30 and TDS varies from approximately 250 million gallons per liter (mg/L) to more than 2000 mg/L. Watershed averages in Wyoming also show variation (BLM, 1999b.); water quality parameters such as SAR vary from an average of 17 in the Powder River Watershed to 9 in the Little Powder River watershed. As CBNG development continues in Wyoming, these average water quality parameter values may change. Surface water quality would be affected by CBNG water discharge, with yearly average SAR values increasing from 4.0 to 4.1 in the Powder River and from 6.0 to 7.5 in the Little Powder River. Impact to the quality of water within the Powder River during low-flow periods is expected to increase water quality concentrations for compounds common to CBNG produced water, including increases in the SAR from values that could be as low as 1 up to approximately 17. During low-flow periods in the Little Powder River, SAR is expected to increase from approximately 6.5 to an estimated value of approximately 9. The Wyoming

EIS (BLM, 1999b.) did not address potential impacts to the Tongue River from discharge of CBNG-produced waters within Wyoming. However, it is expected that impacts of similar magnitude to those predicted for the Powder and Little Powder could occur.

Following the release of the Wyodak EIS (BLM 1999b), the BLM has reassessed the RFD for the Wyoming portion of the Powder River Basin and has issued a new RFD (BLM 2001a). This more recent reasonably foreseeable development study by the BLM indicates that the total number of CBNG wells in the Wyoming portion of the Powder River Basin may approach 50,000 wells (BLM 2001a). This level of development represents an increase of more than 8 times the number of CBNG wells included in the 1999 Wyodak EIS, and if realized, could have a corresponding increase in impact on the quantity and quality of surface water in Montana's Powder River Basin watersheds in terms of annual average measures and especially during periods of low-flow or base-flow. However, actual impacts will be dependant upon the manner in which discharges are managed with respect to CBNG development in Wyoming.

Rivers within the Wyoming portion of the PRB show considerable seasonal variation in terms of flow volume and water quality. The flow volume in the Powder River ranges from a maximum of 1,400 cubic feet per second (cfs) to a minimum of 0.5 cfs. Water quality also varies because flow volume contains varying amounts of meteoric water added to the base-flow contributed by groundwater. If CBNG water discharge rates are essentially constant throughout the year, resultant flows in the river would vary depending upon the ratio of CBNG discharge to natural river flow. Impacts to the Powder River would include a 9 percent increase in the annual average flow volume (450 cfs to 500 cfs), as well as an increase in the annual average SAR value to 5.2. Impacts during natural low-flow periods, however, would cause the river to flow at rates 70 times normal with SAR values in excess of 17.

Annual average flow within the Little Powder River with the impact of CBNG discharge water is extrapolated to increase from 22 cfs to 92 cfs and a resultant SAR of 9. Depending on how CBNG-discharges are managed in Wyoming, these flow rates and water qualities could be maintained during traditionally low-flow periods when the river is normally often dry.

Impacts to the Tongue River drainage are not included in the Wyodak EIS, however, impacts to surface water quantity and quality resulting from the increase in the number of CBNG wells and the resultant increase in the volume of CBNG water discharged in Wyoming are possible. The Upper Tongue River watershed is currently the site of CBNG production and it is expected that more development would occur. Impacts to the Tongue River in Montana are expected to be commensurate with impacts to the Powder and Little Powder Rivers by Wyoming CBNG production. These impacts would result in increases in surface water quantity and decreases in quality. This could result in 3 to 5 times more water entering Montana and an increase in SAR from 0.7 to 5. This is important because Tongue River water quality is the highest in the PRB and the river feeds the Tongue River Reservoir.

Groundwater resources in Montana could also be impacted from CBNG production in Wyoming. CBNG-producing wells in northern Wyoming would cause a drawdown of coal aquifers on adjacent land, with groundwater drawdown possibly extending northward into Montana. Groundwater computer modeling for the Wyodak EIS indicates that the 5-foot drawdown level could extend up to 18 miles from the edge of production, given a 12-gpm per well rate of water withdrawal (BLM 1999b). The modeling values are based on assumptions made regarding the known geology of the Wyoming portion of the basin, which field data has shown to differ from the Montana portion of the basin. The Wyoming coal seams that have been developed are deeper and thicker than the seams in Montana. In addition, the 12-gpm water production value for the state was a "snap-shot" derived from current production data at a single point (1997) early in the life of the PRB CBNG play. The 20-year average rate of 2.5 gpm for Montana was derived from carefully organized data from a single CBNG field considering production trends with time. Nonetheless, both the 12 gpm and the 2.5 gpm rates are projections that may need to be monitored and refined over time as CBNG development proceeds. Given these groundwater modeling results and related assumptions, if CBNG fields were located in Wyoming adjacent to the border with Montana, this could affect groundwater levels for a distance of up to 18 miles into Montana, assuming the parameters used in the Wyoming computer model are applicable to this area of Montana. Drawdown impacts of this magnitude would result in impacts to private lands, the Crow Indian Reservation, state-owned lands, and federal lands controlled by BLM.

CBNG Development on Indian Reservations and the Ashland Ranger District

The development of CBNG resources on the Crow and Northern Cheyenne reservations and on the Ashland Ranger District is assumed to take place during the next 20 years and is therefore included in the cumulative effects analysis. The RFD estimated that 1,400 to 4,000 wells could be developed on each reservation and 50 to 200 wells on the Ashland Ranger District. The impacts associated with this development would be similar to the impacts described within each of the resource topics per alternative and adjusted for magnitude. Of course, the land disturbances, wildlife, cultural and paleontological, visual, social economic, recreational, air quality, soils, and special status species impacts described for those resources would be experienced on the reservations and on the Ranger District. The surface and groundwater quality impacts would be felt on the reservations and on the District but they would also contribute to changes in the watersheds into which the flow.

Tongue River Railroad

The Surface Transportation Board has published a Draft Supplemental Environmental Impact Statement for the Tongue River Railroad Company's (TRRC) proposed rail line construction in Custer, Rosebud and Big Horn Counties, Montana. The document specifically analyzes the proposed 17.3 mile "Western Alignment" route, which had been preceded by two related applications that were considered and approved by the Board in 1986 and 1996, respectively. The proposed Western Alignment is an alternative route for the southernmost portion of the 41-mile Ashland to Decker alignment; known as the Four Mile Creek Alternative. The proposed Western Alignment bypasses the Four Mile Creek alignment, which is generally located from the Birney Road (Hwy 566) and the Tongue River Canyon junction, running west to Hwy 314, then south to the Decker Mine. The Western Alignment would continue south along the Tongue River on the ridge, but paralleling the river and ending around the Spring Creek Mine area.

The Tongue River Railroad is a proposal to build a new rail system to support trains hauling coal along the Tongue River from Miles City to Decker, Montana. The TRRC was authorized to begin construction of the 117-mile railroad in 1996 by the Surface Transportation Board. Operations were scheduled to begin in 2001 but construction has not commenced and no projected start date is available. The rail system, if built, would consist of several spur lines connected to individual coal mines throughout the CBNG emphasis area. The total system would measure approximately 150 miles. Assuming an average 200-foot wide right-of-way, an estimated 3,600 acres would be disturbed by construction and operation activities within the planning areas.

The construction of this rail system would create numerous potential impacts, including socioeconomic issues for local towns along the route, alteration to ranch and grazing lands, reductions in air quality, impediments to Native American cultural sites, increased erosion along the Tongue River riparian areas, increased sedimentation loading in the Tongue River, introduction of noxious weeds, and increased obstructions to wildlife habitat. Specific impacts would be similar to impacts from other surface disturbing activities and emission sources. Details of potential impacts can be found in the EIS and SEIS prepared by the Surface Transportation Board. Mitigation measures would be included with agency permits.

Land Management Agency-Approved Natural Resource Mitigation Measures

Mitigation measures are restrictions on lease operations, which are intended to minimize or avoid impacts to resources or land uses from oil and gas activities. The mitigation measures listed in Table MIN-5 would be applied to permits, leases or approvals granted by the land management agency. The list is not all inclusive, but presents the mitigation measures most often used in the planning area. The wording of the mitigation measure may be modified or additional measures may be developed to address specific conditions. Mitigation measures would be included as appropriate to address site-specific concerns during all phases of CBNG development.

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Disturbed areas resulting from any construction will be seeded following the BLM seeding policy, state guidance or surface owner's requirements. Depending on surface ownership seeding is usually required during the fall or late spring.	X	
To the extent practicable, vegetation will be preserved and protected from construction operations and equipment except where clearing operations are required to conduct oil and gas operations, such as for roads, well pads, pipelines, power lines, utility lines, and structures. Clearing of vegetation will be restricted to the minimum area needed for construction and equipment.	X	
Temporary and permanent access roads will be avoided on south-facing slopes within big game winter range, where practicable.	X	
To the maximum extent practicable, all maintenance yards, field offices, and staging areas will be arranged to minimize disturbance to trees, shrubs, and other native vegetation.	X	
Topsoil removed by construction activities will be stockpiled for reclamation. Sensitive habitat areas will not be used for topsoil storage.	X	
The planting of grasses, forbs, trees, or shrubs beneficial to wildlife will follow the BLM seeding policy. When needed, BLM will require installation of erosion and sedimentation control measures, such as riprap, erosion mats, mulch, bales, dikes or water bars. Riprap material and placement must be approved by the appropriate agency.	X	
Erosion control and site restoration measures will be initiated as soon as a particular area is no longer needed for exploration, production, staging, or access. Disturbed areas will be recontoured to provide proper drainage.	X	
Topsoil piles may be required to be seeded following the BLM seeding policy.	X	
All above-ground electrical poles and lines will be raptor-proofed to avoid electrocution following the criteria and outlined in the Avian Power Line Interaction Committee (APLIC) (1994) and APLIC (1996). (APLIC 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute, Washington D.C. 78 pp.; APLIC 1996. Suggested Practices for Raptor Protection on Power Lines. Edison Electric Institute. Washington, D.C. 128 pp.).	X	

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Conduct three nesting habitat surveys for mountain plover in suitable habitat between May 1 and June 15. Surface use may be deleted in accordance with 43 CFR 3101.1-2.	X	
The Surface Management Agency is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Guidance for application of this requirement can be found in NTL-MSO-85-1.	X	
Cuts and fills for new roads will be sloped to prevent erosion and to facilitate revegetation.	X	
It is the responsibility of the operator to control noxious weeds on lands disturbed in association with oil and gas lease operations. Lease-associated weed control strategies, when required by BLM, are to be coordinated with any involved surface owners and local weed control boards. A pesticide-use proposal must be prepared, and reviewed and approved by BLM prior to any herbicide application on lands disturbed by federal oil and gas lease operations. A pesticide application record must be within 24 hours after completion of application of herbicides. Additional measures may be required to prevent the spread of noxious weeds.	X	
Activities such as stream crossings that could directly impact sensitive or protected fish species will be undertaken during non-spawning periods for these species. In the unlikely event that multiple, sensitive, or protected fish species with back-to-back spawning periods are present in the same stream reach, one of the following options will be exercised. These options include selecting a nearby, alternative stream crossing site that does not provide suitable spawning habitat for the fish species of concern; using a nearby, existing stream crossing over the channel to avoid instream disturbances; or using shore-based equipment to position and extend the pipeline or other item (e.g., temporary bridge) across the stream, thereby avoiding in-channel activities.	X	
Operators must develop a Spill Prevention Control and Countermeasures plan to deal with accidental spills, the plan would include the strategic placement of berms and dikes.	X	
The road ditches would be flat bottomed and "V" ditches would not be allowed. Place water turn outs where appropriate to lessen the water impacts upon the ditches.	X	

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Prior to surface disturbance on slopes over 30 percent, an engineering/reclamation plan must be approved by the authorized officer. Such plan must demonstrate how the following will be accomplished: • Site productivity will be restored. • Surface runoff will be adequately controlled. • Off-site areas will be protected from accelerated erosion, such as rilling, gullying, piping, and mass wasting. • Water quality and quantity will be in conformance with state and Federal water quality laws. • Surface-disturbing activities will not be conducted during extended wet periods. • Construction will not be allowed when soils are frozen.	X	
Surface occupancy and use is prohibited within existing coal leases with approved mining plans.	X	
Surface occupancy and use is prohibited within riparian areas, 100-year flood plains of major rivers, and on water bodies and streams.	X	
Surface use is prohibited from December 1 to March 31 within crucial winter range for wildlife. This stipulation does not apply to the operation and maintenance of production facilities.	X	
Surface use is prohibited from April 1 to June 15 within established spring calving range for elk. This stipulation does not apply to the operation and maintenance of production facilities.	X	
Surface occupancy is prohibited in the designated Bighorn Sheep Range.	X	
Surface occupancy and use is prohibited within ¼ mile of grouse leks.	X	
Surface use is prohibited from March 1 to June 15 in grouse nesting habitat within 2 miles of a lek. This stipulation does not apply to the operation and maintenance of production facilities.	X	
Surface use is prohibited from March 1 – August 1, within ½ mile of raptor nest sites which have been active within the past 2 years. This stipulation does not apply to the operation and maintenance of production facilities.	X	
Surface occupancy and use is prohibited within ¼ mile of designated reservoirs and fisheries.	X	
The "Draft Guidelines for Oil and Gas Activities in Prairie Dog Ecosystems Managed for Black-footed ferret Recovery" (FWS, 1990) will be used as appropriate to develop site-specific conditions of approval to protect black-footed ferret reintroduction and recovery. Specific conditions of approval will depend on type and duration of proposed activity, proximity to occupied ferret habitat, and other site-specific conditions.	X	

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Prior to surface disturbance, prairie dog colonies and complexes 80 acres or more in size will be examined to determine the absence or presence of black-footed ferrets. The findings of this examination may result in some restrictions to the operator's plans or may even preclude use and occupancy that would be in violation of the Endangered Species Act (ESA) of 1973. The lessee or operator may, at their own option, conduct an examination on the leased lands to determine if black-footed ferrets are present, or if the proposed activity would have an adverse effect, or if the area can be cleared. This examination must be done by or under the supervision of a qualified resource specialist approved by the Surface Management Agency (SMA). An acceptable report must be provided to the SMA documenting the presence or absence of black-footed ferrets and identifying the anticipated effects of the proposed action on the black-footed ferret and its habitat. This stipulation does not apply to the operation and maintenance of production facilities.	X	
Surface occupancy and use is prohibited within ½ mile of known bald eagle nest sites which have been active within the past 7 years and within bald eagle nesting habitat in riparian areas.	X	
Surface occupancy and use is prohibited within 1 mile of identified peregrine falcon nesting sites.	X	
Surface occupancy and use is prohibited within ½ mile of known ferruginous hawk nest sites which have been active within the past 2 years.	X	
Surface occupancy and use is prohibited within ¼ mile of wetlands identified as piping plover habitat.	X	
Surface occupancy and use is prohibited within ¼ mile of wetlands identified as interior least tern habitat.	X	
Surface occupancy and use is prohibited within sites or areas designated for conservation use, public use, or sociocultural use.	X	
Surface occupancy and use is prohibited within designated paleontological sites.	X	
Surface occupancy and use is prohibited within developed recreation areas and undeveloped recreation areas receiving concentrated public use.	X	
All surface-disturbing activities, semipermanent and permanent facilities in VRM Class II, areas may require special design, including location, painting, and camouflage, to blend with the natural surroundings and meet the visual quality objectives for the area.	X	
Geophysical exploration for oil and gas will not be allowed in the East Pryor Mountains, and Petroglyph Canyon areas of the Billings RMP area.	X	
Geophysical exploration for oil and gas will be allowed on designated roads and trails with restrictions in the Battle Butte, Finger Buttes, and Reynolds Battlefield areas of the Powder River RMP area.	X	

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Underground explosives for geophysical exploration for oil and gas exploration will not be allowed in the Bridger Fossil area of the Billings RMP area. Other geophysical exploration methods for oil and gas will be allowed at Bridger Fossil if the method will not damage the paleontology resource. If monitoring indicates fossil damage as a result of geophysical activity, it will no longer be allowed.	X	
Geophysical exploration for oil and gas will not be allowed on the significant cultural resource sites of the Castle Butte and Stark Site areas of the Billings RMP area. Geophysical exploration will be allowed (surface methods and vibroseis) in the remainder of the ACEC.	X	
In the sensitive plant areas of the Meeteetse Spires of the Billings RMP area, geophysical exploration for oil and gas will not be allowed by any method. On the remaining area of the Meeteetse Spires, geophysical exploration will be accessed by air only. Exploration will be shot holes and above-ground shots. Vibroseis will not be allowed.	X	
Lessee shall notify and obtain approval from the Department's Trust Land Management Division (TLMD) prior to constructing well pads, roads, power lines, and related facilities that may require surface disturbance on the tract. Lessee shall comply with any mitigation measures stipulated in TLMD's approval.		X
Prior to the drilling of any well, lessee shall send one copy of the well prognosis, including Form 22 "Application for Permit" to the Department's Trust Land Management Division (TLMD). After a well is drilled and completed, lessee shall send one copy of all logs run, Form 4A "Completion Report", and geologic report to TLMD. A copy of Form 2 "Sundry Notice and Report of Wells" or other appropriate Board of Oil and Gas Conservation form shall be sent to TLMD whenever any subsequent change in well status or operator, is intended or has occurred. Lessee shall also notify and obtain approval from the TLMD prior to plugging a well on the lease premises.		X
Issuance of this lease in no way commits the Land Board to approval of coal bed natural gas production on this lease. Any coal bed natural gas extraction wells would require subsequent review and approval by the board.		X
The TLMD will complete an initial review for cultural resources and, where applicable, paleontological resources of the area intended for disturbance and may require a resources inventory. Based on the results of the inventory, the TLMD may restrict surface activity for the purpose of protecting significant resources located on the lease premises.		X
The lessee shall be responsible for controlling any noxious weeds introduced by Lessee's activity on State-owned land and shall prevent or eradicate the spread of those noxious weeds onto land adjoining the lease premises.		X
The lessee is responsible to pay for all damages, including penalties and charges assessed by the USDA-CFSA on CRP lands, as a result of drilling and production on the tract. All damages will be assessed by and paid directly to the TLMD.		X

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
This lease includes areas that may be environmentally sensitive. Therefore, if the lessee intends to conduct any activities on the lease premises, the lessee shall submit to TLMD one copy of an Operating Plan or Amendment to an existing Operating Plan, describing in detail the proposed activities. No activities shall occur on the tract until the Operating Plan or Amendments have been approved in writing by the Director of the Department. TLMD shall review the Operating Plan or Amendment and notify the lessee if the Plan or Amendment is approved or disapproved.		X
After an opportunity for an informal hearing with the lessee, surface activity may be denied or restricted on all or portions of any tract if the Director determines in writing that the proposed surface activity will be detrimental to trust resources and therefore not in the best interests of the trust.		X
This tract contains navigable river beds. No surface occupancy is allowed within the bed of the navigable river, abandoned channels, or on islands and accretions. In addition, upon completion of a successful well, where river title is disputed, the lessee will file an interpleader action under Rule 22, M.R.Civ.P. in the Montana District Court in which the leased lands are located for all acreage within the lease in which the title is disputed. The lessee shall name all potential royalty claimants as defendants.		X
Lessee must contact the owner of the surface in writing at least 30 days prior to any surface activity. A copy of the correspondence shall be sent to TLMD.		X
No surface occupancy shall be allowed on this tract unless otherwise approved in writing by the Director of DNRC.		X
No surface occupancy shall be allowed on any portion of this tract which is indicated as right-of-way on the official highway plans on file at the Department of Transportation in Helena, Montana without prior written approval from TLMD.		X
It is the opinion of the TLMD that drainage is occurring on the land described in this lease and that if a well is not drilled within two years after this lease is issued the department will consider cancellation of the lease for failure to drill an offset well.		X
Prior to the cutting or removal of timber on these tracts for exploration or development related activities, the lessee shall acquire the approval of the appropriate TLMD area office.		X
To protect wildlife during periods important to their survival, surface occupancy or other activity shall be restricted from (date) through (date) of each year unless otherwise authorized in writing by the TLMD. Dates are determined on a case-by-case basis depending on the applicable species.		X
Potential wildlife conflicts have been identified for this tract. The TLMD will contact the Montana Department of Fish, Wildlife, and Parks office in the area for advice on alleviating any possible conflicts caused by lessee's proposed activities. Additional mitigation measures may be required.		X

TABLE MIN-5
MITIGATION MEASURES THAT WOULD BE APPLIED AS APPROPRIATE TO MINIMIZE IMPACTS

Mitigation Measure	BLM	TLMD
Potential wildlife conflicts have been identified for this tract. The TLMD will contact the U.S. Fish and Wildlife Service office in the area for advice on alleviating any possible conflicts caused by lessee's proposed activities. Additional mitigation measures may be required.		X
Wildlife species of concern have been identified on or near this tract. A survey in areas of proposed activity may be required prior to disturbance. Identified species will be avoided, unless otherwise authorized by the TLMD. Additional mitigation measures may also be required.		X
Any activity within 1/8 mile of the river, flood plain, or lake/reservoir on or adjacent to this tract must be approved in writing by the TLMD prior to commencement. No surface occupancy is allowed within the bed of the river, abandoned channels, the bed of the lake/reservoir, or on islands and accretions associated with the river or lake/reservoir.		X
No activity shall be allowed within 100 feet of any perennial or seasonal stream, pond, lake, prairie pothole, wetland, spring, reservoir, well, aqueduct, irrigation ditch, canal, or related facilities without prior approval of the TLMD.		X
Due to unstable soil conditions on this tract and/or steep topography, surface use may be restricted or denied. Seismic activity may be restricted to poltershots.		X
Due to existing surface uses (such as center pivots, wheel lines, etc.) development on this tract may be restricted.		X
Plant species of concern have been identified on or near this tract. A vegetation survey in areas of proposed activity will be required prior to disturbance. Identified rare plant species will be avoided, unless otherwise authorized by the TLMD.		X
A critical weed problem exists on this tract. Additional mitigation measures will be required to prevent further spread of noxious weeds. The department may require such measures as power washing of vehicles, car pooling, timing restrictions for seismic, etc. to facilitate this prevention.		X
This tract contains biological weed-control sites which must be avoided unless otherwise authorized by TLMD.		X
No surface occupancy of the cemetery site is permitted without written approval of TLMD.		X
Wooded areas on this tract will be avoided unless otherwise authorized by the TLMD.		X

MONITORING APPENDIX

MONITORING APPENDIX

Introduction

For each resource, a series of items will be monitored. Each item is evaluated by location, technique for data gathering, unit of measure, and frequency and duration of data gathering. When a duration is not specified, the duration is for the next 20 years. The monitoring plan states the event that will be evaluated and lists the key resources that will be monitored. If an adverse impact can be corrected by a management action within the scope of this plan, the change will be implemented. If the adverse impact can be corrected only by a management action that is outside the scope of this plan the Billings or Powder River Resource Management Plans (RMPs), the management change will be a formal amendment.

Under the phased development alternatives addressed in this SEIS resource based screens are used to phase development. The screens applicable to the preferred alternative (H) are described in detail in this section.

The Department of Natural Resources and Conservation (DNRC) Technical Advisory Committee (TAC) for the Powder River Basin Controlled Groundwater Area has proposed a groundwater monitoring plan for coal bed natural gas (CBNG) development. The monitoring recommendations are incorporated into the monitoring table. A complete copy of that plan is at the end of this appendix. Much of this plan has been adopted and put in place (see reports at http://www.mt.blm.gov/mcfo/cbng/CBNG-Monitoring.htm).

The Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), and the State of Montana (state) have developed a wildlife monitoring and protection plan. It is located as an attachment to the Wildlife Appendix.

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Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
AIR QUALITY	Gaseous and particulate critical air pollutants	area-wide	air quality modeling and ambient air samples	$\mu g/m^3$ and parts per million concentrations as ($\mu g/m^3$)	hourly to 24 hr samples as per standards	predicted or measured exceedances of NAAQS and/or PSD increments by MDEQ	implement additional emission controls or operating limits
	Gaseous and particulate critical air pollutants	Birney/Ashland area	ambient air samples	$\mu g/m^3$ and parts per million concentrations as ($\mu g/m^3$)	hourly to 24 hr samples as per standards	before expanded development activity	implement additional emission controls or operating limits
	Gaseous and particulate critical air pollutants	area-wide	emission inventory	lbs/hr and tons/yr	annually	continuous	require submittal of annual reports
	Cumulative compressor horsepower	area-wide	tracking	horsepower	continuous	when horsepower requirements for CBNG wells in the Montana portion of the PRB exceed 133,956	subsequent visibility modeling; if it indicates unacceptable impacts would occur at a future point in the PRB development, the modeling work would include mitigation scenarios
CLIMATE		areas affected by land disturbance	RAWS or COOP Stations	bulk precipitation	daily during the growing season	extremes affecting revegetation operations	
CULTURAL RESOURCES	Area of Critical Environmental Concern (ACECs)	area-wide	site inspection	site, surrounding area	annually	any noticeable trend indicating increased disturbance—natural or human-caused	increase frequency of monitoring to ensure ACEC values are not being impaired
	20% of National Register eligible sites	CBNG emphasis area	site inspection	site, surrounding area	annually	impacts to sites from unauthorized uses affecting qualities that make sites eligible for listing on National Register of Historic Places	halt activity affecting eligible sites. Increase monitoring of nearby eligible sites. Evaluate damage to sites.
	random sample of 50 sites	CBNG emphasis area	site inspection	site, surrounding area	annually	any noticeable trend indicating increased disturbance—natural or human-caused	increase frequency and number of sites monitored, if sites are being impacted by CBNG-related activities. Evaluate damage to sites.

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Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
HYDROLOGY	surface water quality and quantity	Regionally at the monitoring stations identified by the IWG (see 2005 report later in this appendix). Note that the 10% of 7Q10 criteria for untreated water will apply unless stations upstream and downstream from proposed outfalls are monitored	as determined by the IWG	as determined by the IWG	as determined by the IWG	exceedance of any parameter above the state of MT surface water quality standards, or the identified BLM thresholds	report exceedances to MDEQ, who will determine cause, and take appropriate actions If monitoring indicates that BLM thresholds have been met or exceeded untreated discharge of CBNG water from federal well will no longer be allowed upstream from that station. Previous approvals may be modified.
	groundwater drawdown	regionally at locations determined by the IWG (see TAC report later in this appendix)	monitoring wells would be finished in bedrock units; especially coal seams expected to be developed for CBNG.	depth to water reported in hundredths of feet	depth to water measurements will be made approximately monthly to establish an initial baseline. Measurements will be made approximately quarterly thereafter, unless a greater frequency is determined to be necessary. Monitoring will continue until at least 80% recovery of static water level has been achieved	a 20-foot decrease in static water level from seasonally adjusted mean static water level (determined from baseline data)	if falling water levels are determined to be caused by CBNG activity, operators must offer water well mitigation agreements to all landowners with water sources in the defined drawdown area (20 feet or greater drawdown) of their development. Hydrologic barriers, such as injection wells, may be an option in some cases to prevent drainage of Native American gas and water resources.

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Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
HYDROLOGY (con't)	groundwater quality and quantity	alluvial groundwater would be monitored in stream valleys topographically down gradient from CBNG surface discharge points Since discharge to ephemeral streams would not be allowed, these wells would be along larger streams.	monitoring wells would be finished in the alluvium. Depth to water measurements and water quality parameters, including but not limited to pH, EC, water temperature, common ions (Na, Mg, Ca, K, HCO_3, Cl, SO_4), and would be obtained.	standard quantitative measurements of water quality and static water level (mg/l, °C, µS/cm, and hundredths of feet)	depth to water measurements will be made approximately monthly to establish an initial baseline. Depth to water will then be collected approximately quarterly thereafter. Water quality samples will be taken approximately annually, unless more frequent monitoring is needed. Monitoring will continue until at least 80% recovery of static water level has been achieved	A change in groundwater chemistry that affects its class of use Rise in static groundwater levels of 5-feet or more that may cause impacts at the ground surface	if impacts are determined to result from CBNG development, direct discharge of CBNG water into waterways in the watershed may be discontinued until modified Water Management Plans (WMPs) are submitted and approved
	groundwater quality and quantity	operators will install monitoring wells adjacent to impoundments	a monitoring well will be installed within the first permeable unit and within the first groundwater encountered, up to 50 feet total depth, to determine effectiveness of infiltration or if evaporation basins are leaking a water quality sample of the first groundwater (if encountered) will be collected to determine class of use.	depth to water (feet to water reported in hundredths of feet). Water quality samples will be collected if rises in groundwater are observed or if water is observed in a previously dry zone.	wells will be gauged monthly for the first year and quarterly thereafter unless a rise is observed. If a rise is observed monitoring will be monthly. Water quality samples will be collected whenever the water level is above baseline. Monitoring will continue at least until the end of CBNG water discharge into the impoundment	a rise of 1-foot or more in static water levels above seasonally adjusted mean water levels (determined from the first year of data) or a change in the class of use in the groundwater	Any change in class of use will be reported to MDEQ. Operators may be required to install additional monitoring wells further downgradient, or discharge into impoundments may be required to cease until a revised WMP is submitted and approved

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Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
HYDROLOGY (con't)	springs	a network of springs which are determined to be fed by the regional flow system will be identified along coal outcrops in the CBNG development area	spring discharge and water quality parameters, including but not limited to pH, EC, water temperature, common ions (Na, Mg, Ca, K, HCO_3, CI, SO_4), will be determined from existing springs	discharge (cfs), pH, EC (µS/cm), and water temperature (°C) will be determined in the field. Standard quantitative measurements of water quality also will be used (mg/l)	Field measurement of discharge, pH, EC, and water temperature will be determined approximately quarterly. An initial water quality sample will be collected; additional samples will be analyzed if substantial changes in the field parameters are observed.	a 50% decrease in spring discharge below seasonally adjusted mean (determined in the first 3 years), or a significant change in water quality that affects its beneficial use	if decreased spring discharges or water quality are determined to result from CBNG activity, operators must offer spring mitigation agreements to landowners who use the spring. If impacted spring is identified as important wildlife habitat, adaptive management practices will be used at the landscape level to improve spring ecosystems. Hydrologic barriers, such as injection wells, may be an option in some cases to prevent drainage of Native American gas and water resources.
INDIAN TRUST	groundwater	adjacent to the Northern Cheyenne and Crow reservations	sampling of dedicated monitoring wells in the zones of extraction and zones above and below the expected activity—wells are to be placed in the affected areas to areas unaffected by management activities	standard quantitative measurements of water quality—measurement of depth in feet	field measurements 6 times yearly prior to production activities, continue throughout the activity period and for the duration of 95% of the recovery of pre-development conditions	where site-specific studies show a potential to affect Reservation groundwater, the Tribe would be consulted as to appropriate protection measures and if continuous monitoring shows a drawdown of groundwater that is attributed to CBNG production	BLM would require the operators to modify federal CBNG production. Mitigation options include reducing production rates, shutting in the well or wells, establishing a hydrologic barrier, or providing compensation to the affected Tribe.
INDIAN TRUST (con't)			monitoring wells will be established near the mouth of streams that contain alluvium	measurements of depth in feet	water level measurements will be taken monthly prior to production activity and during the development - water quality measurements will be taken 4 times per year	a 20% rise in the water table above its seasonally adjusted elevation, or a 2 unit increase in the SAR value	Discontinuance of CBNG evaporative ponds in that watershed, or require ponds to be lined

TABLE MON - 1

Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
	natural gas	area-wide	drainage evaluation	radius of drainage	as needed	gas drainage	a communitization agreement, requiring operators to reduce production rates, shut-in wells, change spacing, or establish a hydrologic barrier to protect the Indian minerals from drainage
LANDS AND REALTY	rights-of-way	area-wide	site inspection	right-of-way	minimum of once during or for construction within 2 years of issuance for MLA reviews and within 5 years of issuance for FLPMA reviews; then in the 20th year after issuance and every 10 years thereafter	nonuse of right-of-way or violation of right-of-way grant stipulations	require compliance with right-of-way grant stipulations with possible suspension and/or termination for noncompliance or nonuse
MINERALS **Oil and Gas**	Geophysical Notice of Intent (NOI)	area-wide	line or area inspection	operations conducted in compliance with NOI	minimum of once during operations	violation of regulations, change from approved Notice of Intent, unnecessary or undue degradation	require operator to follow NOI
	Geophysical Notice of Completion (NOC)	area-wide	line or area inspection	operations conducted in compliance with NOC	minimum of once during plugging, once after reclamation	violation of regulations, change from approved NOC unnecessary or undue degradation	require operator to correct violation
MINERALS **Oil and Gas (con't)**	Application for Permit to Drill (APD)	area-wide	site inspection	operations conducted in compliance with Application for Permit to Drill	minimum of once and as necessary	violation of regulations, change from approved Application for Permit to Drill	issue an incidence of noncompliance (INC) with timeframe to correct or shut-in drilling operations
	Sundry Notice	area-wide	site inspection	operations conducted in compliance with Sundry Notice	as necessary	violation of regulations, change from approved Sundry Notice unnecessary or undue degradation	issue an INC with timeframe to correct

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Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
	natural gas	area-wide	drainage evaluation	radius of drainage	as needed	if gas drainage is occurring, there would be a communitization agreement, drilling of protective wells on federal lands, or different spacing, to protect the federal minerals from drainage	certified letter to lessee requiring protection, compensation royalty, relinquishment
	produced water disposal	area-wide	site inspection	operations conducted in compliance with permit	minimum of once annually or as necessary	violation of regulations, change from approved permit, unnecessary or undue degradation	issue an INC with timeframe to correct or shut-in operations
	spill	area-wide	site inspection	area cleaned up, reclaimed	minimum of once after event and as necessary	violation of regulations, change from approved permit, unnecessary or undue degradation	issue an INC and operator cleanup required
	plugged, abandoned wells	area-wide	site inspection	operations conducted in compliance with permit	minimum of once during operations	violation of regulations, change from approved permit, unnecessary or undue degradation	issue an INC correction required
	abandoned well reclamation	area-wide	site inspection	operations conducted in compliance with permit	minimum of once and as necessary until reclamation complete	violation of regulations, change from approved permit, unnecessary or undue degradation	issue an INC/certified letter requiring proper operator rehabilitation
PALEONTOLOGY	significant paleontological localities, ACECs	area-wide	inspection of area disturbed	degradation caused by human or natural activities that lead to loss of significant fossil resources	once yearly	loss or damage to significant fossil resources	closure of areas surrounding site to prevent further disturbance to significant fossil resources
RECREATION	general recreation use	area-wide with emphasis on dispersed use of undeveloped recreation sites	area inspections to look for vandalism, resource abuse, and install photo points	site condition	biannual (June and October); photograph annually	user conflicts, resource degradation, or safety hazards	avoid location of oil and gas facilities in undeveloped recreation sites having concentrated use, and coordinate timing of exploration activities to minimize conflicts during peak periods of use

TABLE MON - 1

Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
	concentrated recreation use	special recreation management areas, sites with recreation facilities	visitor registration, traffic counters estimates, photo points	visitor days, site condition	visitor registration boxes, counters checked once monthly at the minimum, weekly or biweekly during heavy use periods, photograph annually	increased visitor use per year or sustained use that requires additional or improved facilities	avoid location of oil and gas facilities in developed recreation sites having concentrated use, and coordinate timing of exploration activities to minimize conflicts during periods of use
		area-wide commercial, competitive activities	administrative review, site inspection for complexes with permit stipulations	permit stipulations, resource condition success of reclamation	on site during competitive events, periodic site inspection for commercial operations, administrative review annually	irreparable resource damage, compromise of visitor safety, recreation experience	avoid location of oil and gas facilities in areas where know commercially permitted recreation activities are occurring and coordinate timing of exploration activities to minimize conflicts during peak periods of use

TABLE MON - 1

Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
SOILS	soil erosion, uplands	area-wide where management activities are occurring or expected to occur	visual observation and surveyed erosion pins	soil loss in tons per acre	site will be visually examined quarterly. Where erosion is deemed excessive, measurements of site characteristics will be taken to determine rate of soil loss.	visual evidence of rill, gully, or sheet erosion. Loss of soil exceeding 10 tons per acre	report exceedance to BLM, MDEQ, or EPA. If caused by CBNG discharge or activities, enforcement action will be taken.
	soil erosion, streambank, and floodplain	area-wide along rivers and tributaries where management activities are occurring or expected to occur	visual observation and surveyed erosion pins	area effected in square feet or acres	site will be visually examined quarterly. Where streambank erosion is deemed excessive, measurements of site characteristics will be taken to determine soil loss.	a 10% increase in streambank loss	report exceedance to BLM, MDEQ, or EPA. If caused by CBNG discharge or activities, enforcement action will be taken.
	soil salinization	area-wide where management activities are occurring or expected to occur	visual observation, measurement of soil characteristics such as pH, EC, SAR	area effected in square feet or acres	site will be visually examined quarterly. Where salinity levels show an increase because of vegetation or soil effects, measurements of site characteristics will be taken to determine salinity levels.	a 20% increase in conductivity levels	report exceedance to BLM, MDEQ, or EPA. If caused by CBNG discharge or activities, enforcement action will be taken.
	compaction	areas effected by extraction activities	penetrometer or visual inspection	pounds per square inch	1 to 2 times yearly	10% increase in density	limit or block access to compacted sites

TABLE MON - 1

Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
VEGETATION							
	ecological status	areas affected by disturbance through the pre-production, production, post-production processes	ecological site method in key areas	composition, production compared to potential natural community for each site	pre-development ecological status baseline data	status is reduced by 15% or a drop in class	ecological site integrity will be altered to increase status of ecological site index by 15% or an increase in ecological class
	trend	areas affected by disturbance through the pre-production, production, post-production processes	any suitable methods as described in TR 4400-4 or the National Range Handbook	apply to the technique selected, may include number of individuals per unit area, percent cover, percent frequency, or percent species composition	every 3 to 5 years after the collection of ecological status baseline data	a change in the direction of trend away from management	measure implementation of action put forth to mitigate reduction of ecological status using techniques listed in monitoring appendix for vegetative trend
Noxious Weeds	trend	areas affected by disturbance through the pre-production, production, post-production processes	Montana Noxious Weed Standards	acres, plants per square feet, species	yearly (through post production reclamation)	10% increase beyond objectives for the area/new species occurrence or infestation	operators will be required to contain and suppress noxious weeds. Conservation measures will be required in noxious weed sites to decrease population of noxious weeds and increase population of native plant community
Riparian/ Wetlands	condition, trend, age class structure, streambank alteration	any federal action (including split estate)	photo plot, estimate key areas by sight inspection, Cole Browse Method, Key Forage Method, other methods found in Technical References (TR4400-3, TR4400-4, TR4400-7, TR1737-3, TR1737-8, TR1737-9) including MRWA (Montana Riparian Wetland Association) Riparian Inventory for areas not previously inventoried MRWA PFC on inventory areas	percent species composition, percent in each age class, percent utilization, height, percent of the streambank	based on activity plan schedule- a minimum of once every 5 years	trend away from objective or when no improvement occurs, in unsatisfactory habitat condition/functioning at risk with downward trend	oil and gas operators will be required to alter activities in order to provide environmental factors for increasing functionality or habitat conditions of the streams/wetlands. Oil and gas operators may be required to develop replacement wetlands in order to compensate for overall loss of wetlands according to Section 404 of Clean Water Act.

TABLE MON - 1

Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
Special Status and Threatened and Endangered (T&E) Plant Species	condition	areas affected by disturbance through the pre-production, production, post-production processes	Montana Natural Heritage Program and visual inspection	presence and condition	once during the growing season, at a minimum	downward trend in plant condition caused by oil and gas activities	oil and gas operators will be required to alter their activities in order to benefit environmental factors required by special status or T&E plant species
WILDLIFE (see also "Wildlife Appendix for the Programmatic Wildlife Monitoring and Protection Plan)							
Aquatic Biological Diversity (flora/fauna)	population diversity	intermittent/perennial streams associated with produced water discharge	stream sampling	diversity index	every 3 years	downward trend overall stream biological diversity	reduction or elimination of untreated produced water into drainage or watershed
Big Game	seasonal habitat use	project area plus 1-mile buffer	air/ground field inspection	occupancy	annually	downward trend in habitat occupancy	extension of timing stipulations or conditions of approval, off-site habitat management or enhancement
Black-footed Ferret	occupancy	prairie dog towns larger than 80 acres located within 0.5 mile of proposed activity	ground inspection	occupancy	determined on a site-specific basis in coordination with U.S. Fish and Wildlife Service (FWS)	habitat decline or prairie dog fatalities caused by oil and gas activities - occupancy of black-footed ferrets would be managed in a Black-Footed Ferret Management Plan	no incidental take; reinitiate consultation if new information shows it may be effected
Burrowing Owl	active nest locations	specific project area plus 0.5-mile buffer (within active prairie dog town)	ground inspection	occupancy	twice yearly (June to August)	human-caused disturbance to owls related to oil and gas activities such as vandalism and harassment	extension of timing and/or increase of distance from nest; stipulations or conditions of approval
Grey Wolf	occupancy	Billings RMP area	air/ground field surveys	number of sitings	annually until reintroduction objectives are met	1- to 3-year downward trend in production or occupancy	no incidental take; reinitiate consultation if new information shows it may be effected

TABLE MON - 1

Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
Migratory Non-game Birds	occupancy	project area plus 0.25-mile buffer	ground observations	occupancy	periodically	documented fatalities caused by oil and gas activities	refinements in infrastructure planning (project plans), implementation of travel corridors, enhanced reclamation standards, and off-site habitat management or enhancement
Mountain Plover	active nest locations	specific project area plus 0.5-mile buffer (within areas less than 4-inch average vegetation height and prairie dog towns)	ground inspection	occupancy	twice yearly (April 15 to June 30)	human-caused disturbance to mountain plovers related to oil and gas activities such as vandalism and harassment	BLM received an exemption from the prohibitions of Section 9 of ESA regarding take by agreeing to terms and conditions in biological opinion (BO). Incidental take of habitat and individuals allowed up to level stated in BO. Take must be monitored. Reinitiation of Section 7 will occur before allowable take is exceeded.
Prairie Dog	active prairie dog colony	specific project area plus 0.5-mile buffer	air/ground inspection	occupancy	annually	documented prairie dog fatalities caused by oil and gas activities	establishment of no surface occupancy zones and/or establishment of timing restrictions within prairie dog towns
Raptors	active nest locations (excluding burrowing owls)	project area plus 1-mile buffer	air/ground field inspection	number of nests	every 3 years	downward trend in occupancy	extension of timing and/or increase in distance from nest; stipulations or conditions of approval

TABLE MON - 1

Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
WILDLIFE **Raptors (con't)**	raptor productivity (including Burrowing owl)	active nests within 1-mile of project disturbance plus 1-mile buffer	air/ground field inspection	nest success/failure species productivity	annually	downward trend in nest success, overall productivity	extension of timing and/or increase in distance from nest; stipulations or conditions of approval
	raptor productivity-selected undeveloped comparison area	project area	air/ground field inspection	nest success/failure species productivity	every 5 years	information used as support to determine downward trend	extension of timing and/or increase in distance from nest; stipulations or conditions of approval
Sage Grouse	sage grouse lek location	CBNG overall project area	aerial field inspection	number, location of leks	every 5 years	downward trend in habitat occupancy	extension of timing and/or increase in distance from lek; stipulations or conditions of approval; off-site habitat management/mitigation
	sage grouse lek attendance	specific project development areas plus 2-mile buffer	air/ground field inspection	number of males/lek	annually	downward trend in lek attendance	extension of timing and/or increase in distance from lek; stipulations or conditions of approval; off-site habitat management/mitigation
	sage grouse winter habitat	project area plus 2 mi. buffer	air/ground field inspection	occupancy	annually	downward trend in habitat occupancy or quality caused by oil and gas activities	extension of timing and/or increase in distance from lek; stipulations or conditions of approval; off-site habitat management/mitigation

TABLE MON - 1

Element	Item	Location	Technique	Unit of Measure	Frequency and Duration	Remedial Action Trigger	Management Options
Special Status Species (BLM and Montana Natural Heritage Program lists)	occupancy	specific project area plus 1-mile buffer	ground field inspection	occupancy	annually at a minimum via species habitat requirements	downward trend in habitat occupancy or quality caused by oil and gas activities	establishment of timing and/or distance from breeding area through stipulations or conditions or approval
Threatened, Endangered and Proposed Species other than previously described	occupancy, productivity	CBNG overall project area	air/ground field inspection	occupancy	determined on a site-specific basis in coordination with FWS	habitat decline or fatalities caused by oil and gas activities; occupancy of species would be managed in a site-specific Management Plan	reinitiate section and consultation with FWS

Prepared in cooperation with the Montana Department of Environmental Quality

Surface-Water Monitoring in Watersheds of the Powder River Basin, 2005

Powder River Basin Interagency Working Group

The Powder River Basin (PRB) is a geologic structural basin that contains an extensive natural gas resource associated with regional coal deposits. This coalbed natural gas (CBNG) is located beneath millions of acres of private and public land in southeastern Montana and northeastern Wyoming (fig. 1). The PRB Interagency Working Group (IWG) was established in June 2003 as a forum to identify, discuss, and find solutions to issues of common concern to government agencies involved in permitting and monitoring CBNG development. The PRB IWG is led by the Bureau of Land Management (BLM) and is composed of managers and technical staff from local, State, tribal, and federal government agencies with land management, conservation, or regulatory responsibilities in the PRB, as well as agencies like the U.S. Geological Survey (USGS) that provide technical support.

The mission of the PRB IWG is to: (1) provide for environmentally sound energy development, (2) develop coordinated and complementary best management practices, guidelines, and programs related to CBNG activities to conserve and protect resources, (3) monitor the impact of CBNG activities and assess the effectiveness of mitigating measures, (4) develop and integrate the databases and scientific studies needed for effective resource management and planning, and to make that information readily available, and (5) promote compatibility in the application of each agency's mission.

In order to more effectively address the technical issues presented by CBNG development, Task Groups that are staffed by technical specialists from the member agencies of the PRB IWG were formed to address specific resource issues. The Task Groups include Air, Aquatics, Water, and Wildlife. More information about the PRB IWG and Task Group activities is available at URL *http://www.wy.blm.gov/bfo/prbgroup/index.htm*.

Water Task Group

Substantial volumes of ground water are extracted from coalbeds in order to produce CBNG. The removal of ground water from aquifers and use or disposal of produced water on the surface have the potential to cause environmental impacts. One objective of the Water Task Group is to develop and implement monitoring plans for surface water and ground water at local and regional scales. This monitoring will help agencies make more informed decisions regarding CBNG permitting, and allow for dissemination of information to the public. This factsheet summarizes the surface-water-monitoring plan developed by the Water Task Group and describes the surface-water monitoring accomplished during 2005.

Surface-Water-Monitoring Plan

The surface-water-monitoring plan is a proposed sampling network that is generally composed of sites where PRB IWG member agencies have been conducting surface-water monitoring. Sampling sites may be located on mainstems or selected tributaries in each watershed (fig. 1, table 1). Proposed sampling frequencies vary with stream type and constituent class (table 2). The constituent classes recommended for monitoring include:

- Streamflow
- Field measurements—pH, dissolved oxygen, specific conductance, and temperature
- Major ions—dissolved calcium, magnesium, potassium, sodium, alkalinity, chloride, fluoride, sulfate, and silica; dissolved solids; and sodium-adsorption ratio
- Nutrients—total and dissolved nitrogen and phosphorus species
- Trace elements (primary)—total and dissolved aluminum, arsenic, barium, beryllium, iron, manganese, and selenium
- Trace elements (secondary)—total and dissolved cadmium, copper, chromium, lead, nickel, and zinc.
- Suspended sediment

U.S. Department of the Interior
U.S. Geological Survey

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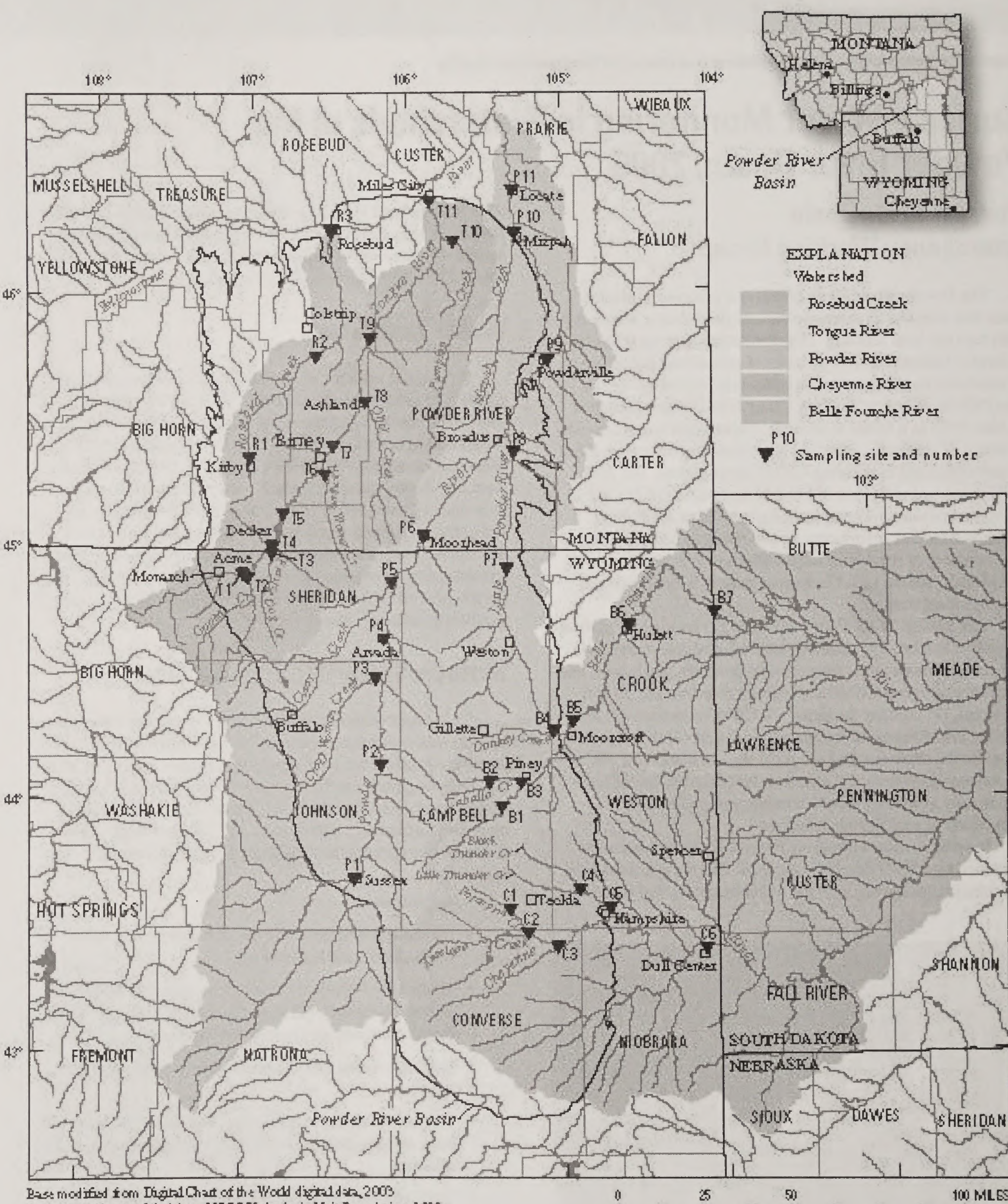
Fact Sheet 2005–3137
December 2005



Base modified from Digital Chart of the World digital data, 2003
Drainage basins modified from USGS Hydrologic Unit Boundaries, 1999
Albers Equal-Area projection, standard parallels 20° and 60°, central meridian -105°30'

Figure 1. Location of sampling sites proposed in the Water Task Group's surface-water-monitoring plan for the Powder River Basin.

Table 1. Sampling sites proposed in the Water Task Group's surface-water-monitoring plan for the Powder River Basin.

Map number	U.S. Geological Survey site number	Site name	Stream type
R1	06295113	Rosebud Creek at reservation boundary near Kirby, Mont.	Mainstem
R2	06295250	Rosebud Creek near Colstrip, Mont.	Mainstem
R3	06296003	Rosebud Creek at mouth, near Rosebud, Mont.	Mainstem
T1	06299980	Tongue River at Monarch, Wyo.	Mainstem
T2	06305700	Goose Creek near Acme, Wyo.	Tributary
T3	06306250	Prairie Dog Creek near Acme, Wyo.	Tributary
T4	06306300	Tongue River at State line near Decker, Mont.	Mainstem
T5	06307500	Tongue River at Tongue River Dam, near Decker, Mont.	Mainstem
T6	06307600	Hanging Woman Creek near Birney, Mont.	Tributary
T7	06307616	Tongue River at Birney Day School Bridge, near Birney, Mont.	Mainstem
T8	06307740	Otter Creek at Ashland, Mont.	Tributary
T9	06307830	Tongue River below Brandenberg Bridge, near Ashland, Mont.	Mainstem
T10	06308400	Pumpkin Creek near Miles City, Mont.	Tributary
T11	06308500	Tongue River at Miles City, Mont.	Mainstem
P1	06313500	Powder River at Sussex, Wyo.	Mainstem
P2	06313605	Powder River below Burger Draw, near Buffalo, Wyo.	Mainstem
P3	06316400	Crazy Woman at Upper Station, near Arvada, Wyo.	Tributary
P4	06317000	Powder River at Arvada, Wyo.	Mainstem
P5	06324000	Clear Creek near Arvada, Wyo.	Tributary
P6	06324500	Powder River at Moorhead, Mont.	Mainstem
P7	06324970	Little Powder River above Dry Creek, near Weston, Wyo.	Tributary
P8	06325500	Little Powder River near Broadus, Mont.	Tributary
P9	06325650	Powder River near Powderville, Mont.	Mainstem
P10	06326300	Mizpah Creek near Mizpah, Mont.	Tributary
P11	06326500	Powder River near Locate, Mont.	Mainstem
C1	06364300	Porcupine Creek near Teckla, Wyo.	Tributary
C2	06364700	Antelope Creek near Teckla, Wyo.	Tributary
C3	06365900	Cheyenne River near Dull Center, Wyo.	Mainstem
C4	06375600	Little Thunder Creek near Hampshire, Wyo.	Tributary
C5	06376300	Black Thunder Creek near Hampshire, Wyo.	Tributary
C6	06386500	Cheyenne River near Spencer, Wyo.	Mainstem
B1	06425720	Belle Fourche River below Rattlesnake Creek near Piney, Wyo.	Mainstem
B2	06425800	Caballo Creek near Gillette, Wyo.	Tributary
B3	06425900	Caballo Creek at mouth, near Piney, Wyo.	Tributary
B4	06426400	Donkey Creek near Moorcroft, Wyo.	Tributary
B5	06426500	Belle Fourche River below Moorcroft, Wyo.	Mainstem
B6	06428050	Belle Fourche River below Hulett, Wyo.	Mainstem
B7	06428500	Belle Fourche River at Wyoming-South Dakota State line	Mainstem

Table 2. General sampling strategy proposed in the Water Task Group's surface-water-monitoring plan for the Powder River Basin.

Stream type	Sampling frequency	Constituent class
Mainstem	Continuous	Streamflow
	12 times per year	Field measurements
	12 times per year	Major ions
	2 times per year	Nutrients
	12 times per year	Trace elements, primary
	2 times per year	Trace elements, secondary
	12 times per year	Suspended sediment
Tributary	Continuous	Streamflow
	6 times per year	Field measurements
	6 times per year	Major ions
	2 times per year	Nutrients
	6 times per year	Trace elements, primary
	2 times per year	Trace elements, secondary
	6 times per year	Suspended sediment

Monitoring Summary, 2005

Because of funding shortfalls for surface-water monitoring, only part of the proposed sampling in the surface-water-monitoring plan was accomplished during 2005 (table 3). For the sites where the sampling was partially completed, either the sampling frequency was less than the proposed sampling frequency or not all of the constituent classes were analyzed. The Tongue River watershed was the only watershed where the sampling proposed in the surface-water-monitoring plan was fully completed.

Several of the agencies that participate on the PRB IWG contributed funding for monitoring and reporting, including:

- BLM,
- Montana Department of Environmental Quality,
- Montana Department of Natural Resources and Conservation,
- Northern Cheyenne Tribe,
- U.S. Environmental Protection Agency,
- USGS,
- Wyoming Department of Environmental Quality, and the
- Wyoming State Engineer's Office.

Streamflow data and water-quality samples were collected by USGS personnel using standard USGS field methods (*http://water.usgs.gov/owq/FieldManual/*). Samples were analyzed at the USGS National Water Quality Laboratory in Lakewood, Colorado.

Table 3. Monitoring accomplished for surface-water-monitoring plan during 2005.

[●, completed; ○, partially completed; and ○, not completed.]

Map number	Stream-flow	Field measure-ments	Major ions	Nutrients	Trace elements, primary	Trace elements, second-ary	Sus-pended sediment
R1	●	●	●	●	●	○	●
R2	●	○	○	○	○	○	○
R3	●	○	○	○	○	○	○
T1	●	●	●	●	●	●	●
T2	●	●	●	●	●	●	●
T3	●	●	●	●	●	●	●
T4	●	●	●	●	●	●	●
T5	●	●	●	●	●	●	●
T6	●	●	●	●	●	●	●
T7	●	●	●	●	●	●	●
T8	●	●	●	●	●	●	●
T9	●	●	●	●	●	●	●
T10	●	●	●	●	●	●	●
T11	●	●	●	●	●	●	●
P1	●	●	●	○	○	○	○
P2	○	●	●	○	○	○	○
P3	●	●	●	●	○	○	●
P4	●	●	●	○	○	○	○
P5	●	●	●	○	○	○	○
P6	●	●	●	●	●	●	●
P7	●	●	●	●	○	○	●
P8	○	●	●	●	●	●	●
P9	○	○	○	○	○	○	○
P10	○	○	○	○	○	○	○
P11	●	●	●	●	●	●	●
C1	●	●	●	○	○	○	○
C2	○	●	●	○	○	○	○
C3	●	●	●	○	○	○	○
C4	○	●	●	○	○	○	○
C5	○	●	●	○	○	○	○
C6	●	●	●	○	○	○	○
B1	○	●	●	○	○	○	○
B2	○	●	○	○	○	○	○
B3	○	●	●	○	○	○	○
B4	○	●	●	○	○	○	○
B5	●	●	●	●	○	○	○
B6	○	●	●	●	○	○	○
B7	●	○	○	○	○	○	○

Data Availability

Data collected as part of Water Task Group surface-water-monitoring plan are stored electronically in the USGS National Water Information System. Continuous streamflow and water-quality data are available to the public at URL: *http://waterdata.usgs.gov/nwis/*. Other USGS data for Montana and Wyoming can be accessed at *http://mt.water.usgs.gov/*, *http://tonguerivermonitoring.cr.usgs.gov/*, and *http://wy.water.usgs.gov/*.

Future Work

Another objective of the Water Task Group is to interpret the surface-water-monitoring data that are collected. Until more data are collected, much of the initial interpretive analysis may focus on sites with historical data that were collected for previous monitoring programs. For example, the Powder River at Arvada, Wyoming has been sampled for many years, and relations between constituents, such as specific conductance and the sodium-adsorption ratio, have been established (fig. 2). If the monitoring data indicate that water quality is changing, managers can use adaptive management and appropriate mitigation measures to address environmental concerns.

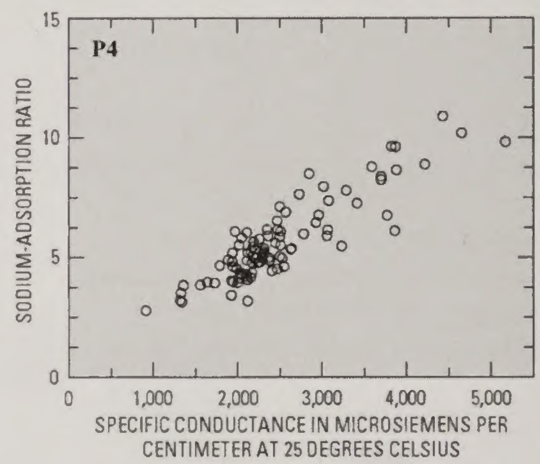


Figure 2. Specific conductance and sodium-adsorption ratio relation for the Powder River at Arvada, Wyo.

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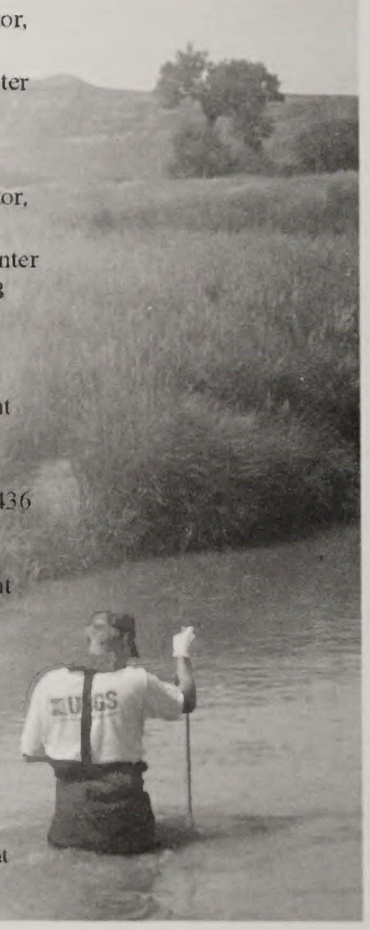
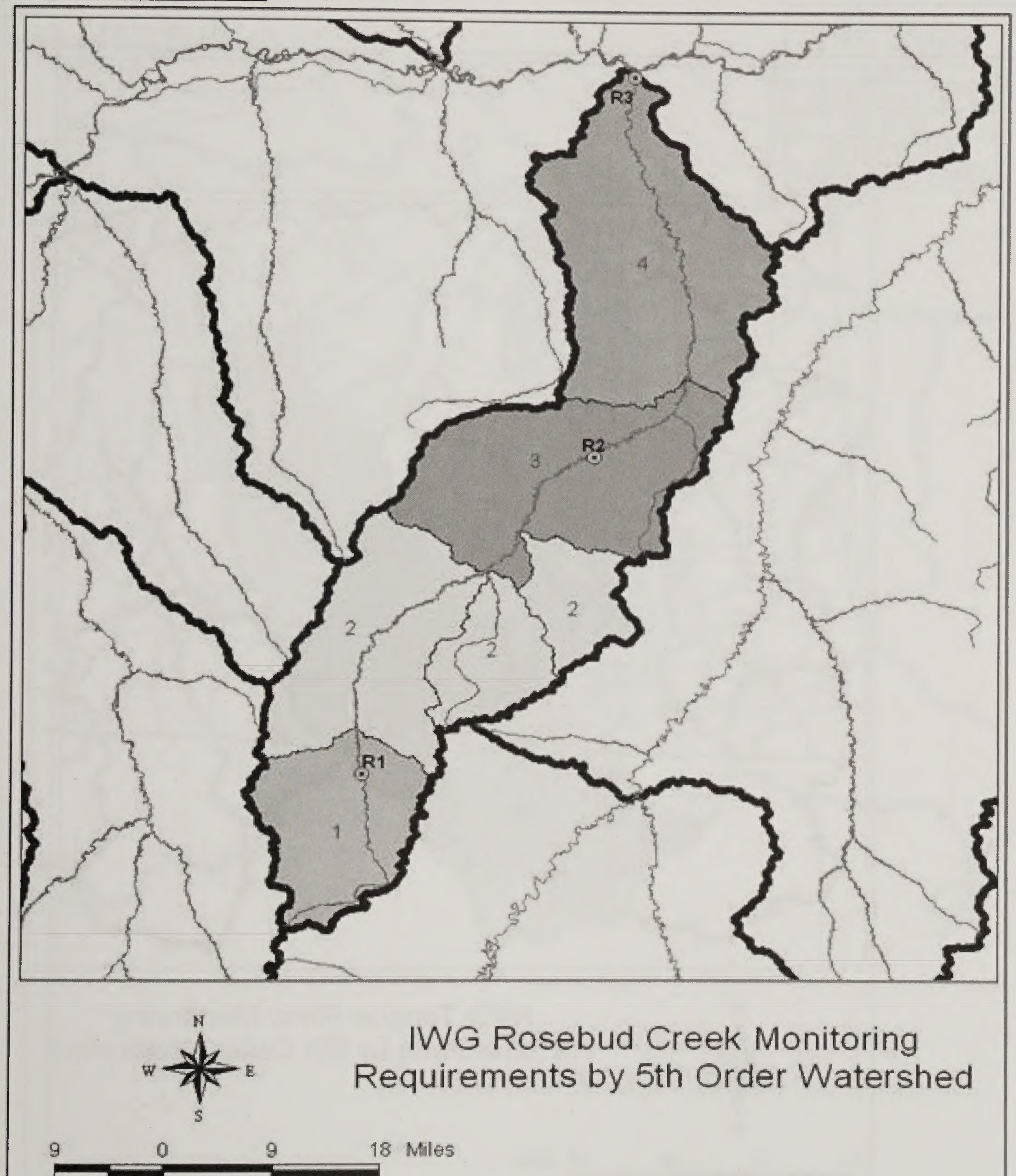


By Melanie L. Clark[1], John H. Lambing[1], and Andrew L. Bobst[2]
[1]U.S. Geological Survey
[2]Bureau of Land Management

Layout by Suzanne C. Roberts

Rosebud

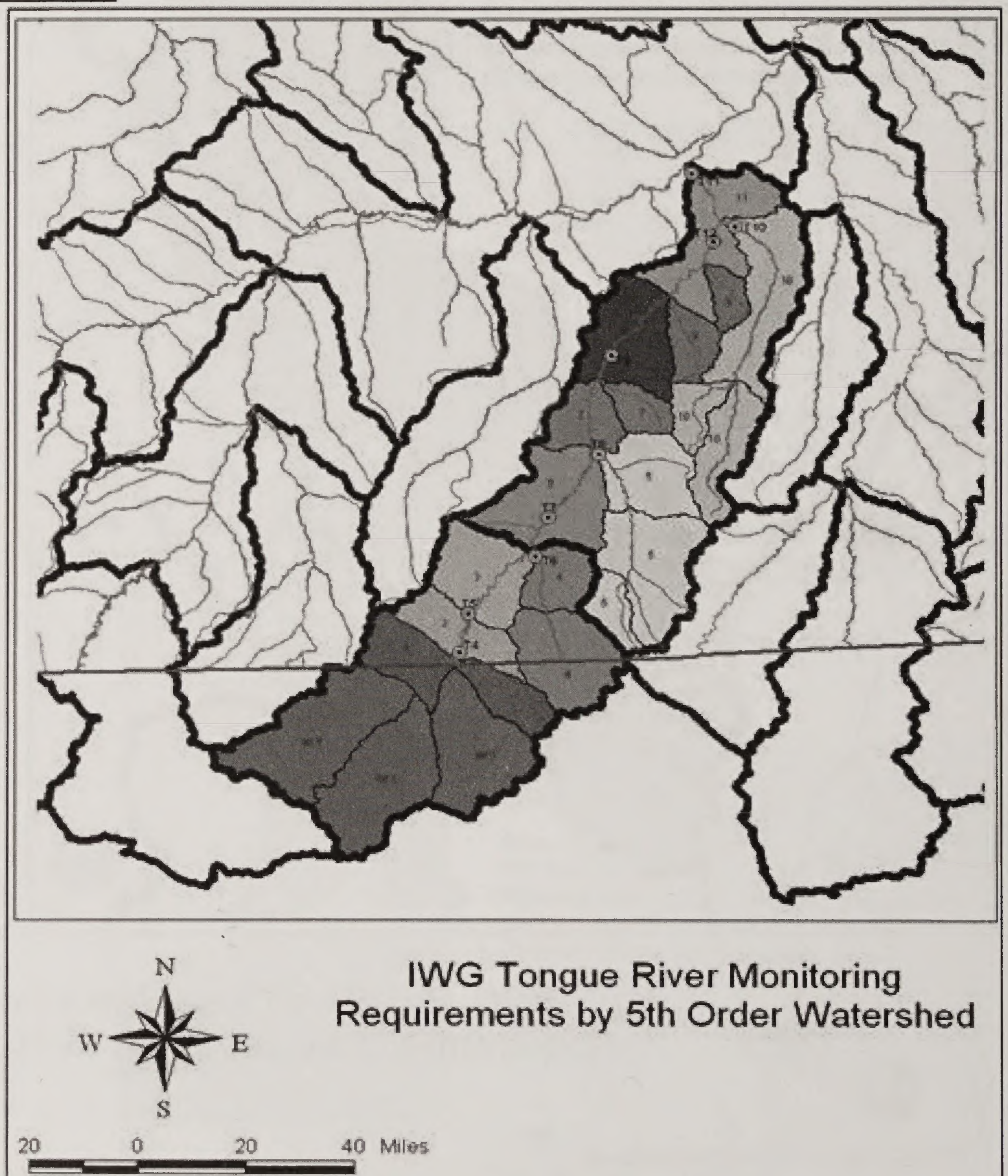
Group	Monitoring Required
1	R1 or R1&R2
2	R1&R2
3	R1&R2 or R2&R3
4	R2&R3



IWG Rosebud Creek Monitoring Requirements by 5th Order Watershed

Tongue

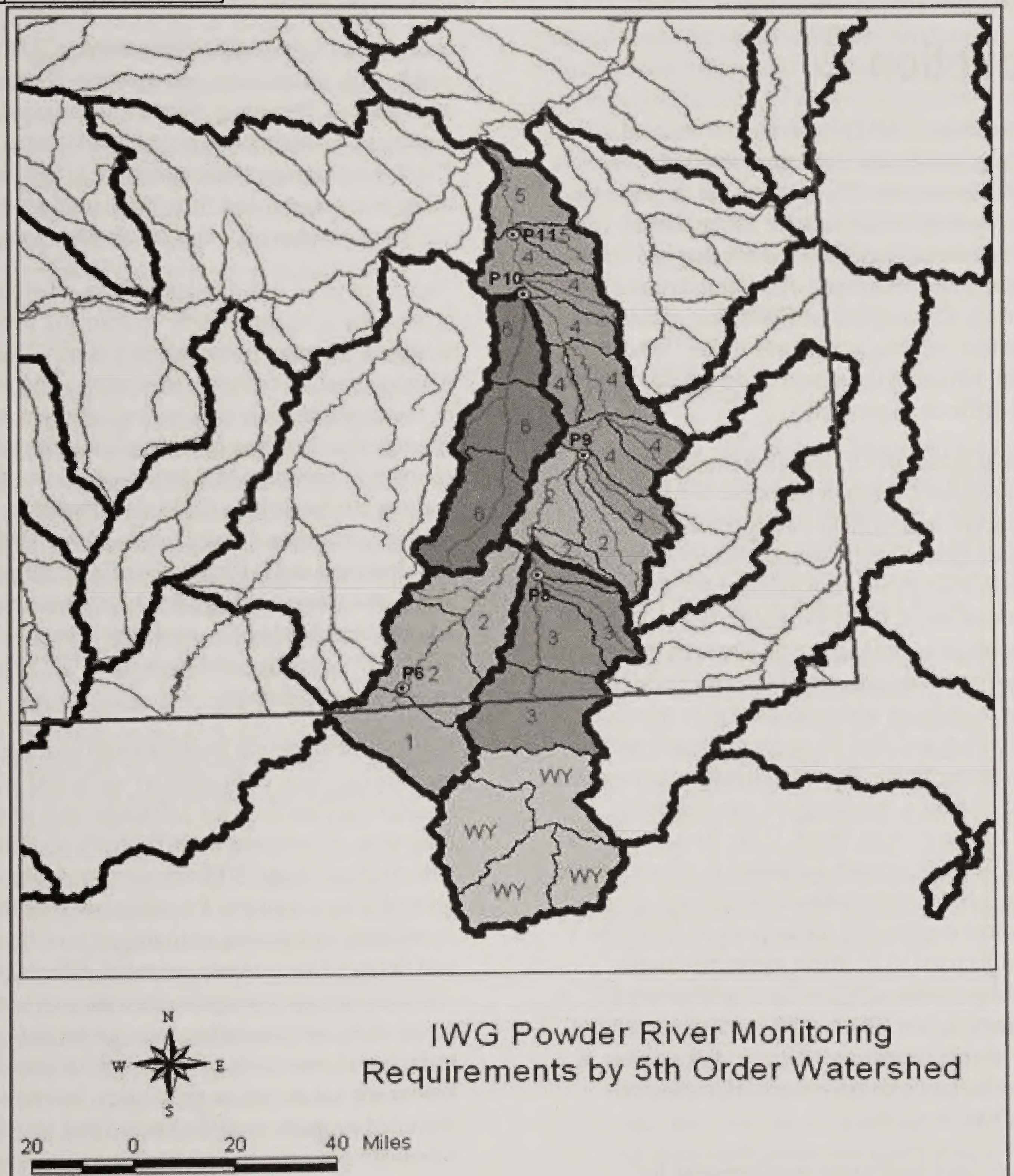
Group	Monitoring Required
1	T4
2	T4&T5
3	T5&T7
4	T5,T6&T7
5	T7,T8,&T9
6	T5&T7 or T7&T9
7	T7&T8
8	T7&T9 or T9&T12
9	T9&T12
10	T10,T11&T12
11	T9&T12 or T12&T11



IWG Tongue River Monitoring Requirements by 5th Order Watershed

Powder

Group	Monitoring Required
1	P6
2	P6&P9
3	P6,P8&P9
4	P9&P11
5	None
6	P9,P10&P11



IWG Powder River Monitoring Requirements by 5th Order Watershed

REGIONAL-SCALE MONITORING OF POTENTIAL EFFECTS OF COAL BED METHANE DEVELOPMENT ON WATER RESOURCES

Prepared by the Technical Advisory Committee for the Powder River Basin Controlled Groundwater Area

Introduction

Coal bed methane (CBM) is released from coal seams by pumping groundwater from coal seams to lower ground water pressures. The coal seams targeted for CBM development in the Powder River Basin constitute important regional aquifers that provide water for domestic, livestock, agricultural, and industrial uses. Consequently, CBM production will probably affect existing water uses in the Powder River Basin, although the extent and magnitude of effects are difficult to predict.

The Montana Board of Oil and Gas Conservation (MBOGC) requires, through its Order No. 99-99, that CBM producers submit field development plans that include groundwater characterization and monitoring. In addition to complying with existing MBOGC rules for wildcat gas wells, CBM producers are required to describe baseline hydrologic conditions, to inventory existing wells and springs, to offer water mitigation agreements to existing water users, and to monitor water production and shut-in water pressures within coal bed methane fields. Water mitigation agreements must be offered for a minimum of one-half mile (expanded to one mile in Mont. Code Ann. 85-2-521) from CBM fields or greater distances if effects extend father. The U.S. Environmental Protection Agency (EPA) requires monitoring under permits for Class V injection wells used to re-inject water produced during CBM production. Specific requirements of Class V injection permits may include monitoring of injection pressure, injection rate and total volume at injection wells, and ground water elevations in monitoring wells.

There are no clear regulatory requirements for monitoring effects to ground water levels or spring flows outside the one-mile minimum specified by MBOGC or the area affected by Class V injection wells. Groundwater monitoring conducted by CBM producers within and near CBM fields, as required by MBOGC or the U.S. EPA, will not reveal broad regional effects. Therefore, regional-scale monitoring needs to be conducted outside areas of potential CBM development to allow potential effects to be evaluated before, during, and after the period of CBM production. In addition, the spacing of monitoring sites and the frequency of monitoring needs to be sufficient to distinguish potential effects attributed to CBM development from potential effects attributed to other water users, and from ambient/seasonal variations in ground water levels and spring flows.

The purpose of this document is to establish design criteria for a regional-scale monitoring program intended to detect potential effects of CBM development on existing water uses. The objectives of the regional scale monitoring program are to characterize baseline hydrologic conditions, detect changes in ground water levels and flows from springs attributable to CBM development, and verify recovery of ground water levels after CBM development ends. Regional-scale monitoring of wells and springs is intended to augment and compliment field-scale monitoring established under MBOGC Order No. 99-99 or EPA UIC Class V injection well permits.

Criteria for selecting locations and spacing for monitoring sites, consisting of wells and springs, and monitoring practices are proposed here to ensure that long-term monitoring is sufficiently comprehensive to detect effects that CBM development might have on ground-water systems. Priorities are proposed to coordinate monitoring with the pace of development and the need to evaluate potential effects, and recommendations are presented for implementing monitoring and managing monitoring data. The criteria and monitoring recommendations described below are not meant as rigid rules, but rather are intended to guide qualified personnel in selecting monitoring locations and implementing monitoring that meet the objectives stated above.

The BLM, at its discretion, will administer the regional-scale monitoring program, while operators will be responsible for all in-field monitoring. The BLM has a commitment to maintaining the water monitoring of the PRB region, similar to their continued (25+ years) funding of the MBMG for coal mine water monitoring. The BLM will also partner

with operators for in-field monitoring when federal gas is produced.

Criteria and Monitoring Practices

The portion of the Powder River Basin underlain by coals of the Tongue River Member of the Fort Union Formation is generally considered to have potential for CBM development. Within this area, however, CBM is less likely to be developed from coal seams with limited thickness and ambient ground water pressures; conditions that indicate limited potential for gas production. These areas, located primarily within 2 to 5 miles of coal outcrops, should be targeted for monitoring wells.

The Anderson-Dietz, Canyon, Wall, and Knobloch are the four primary coal seams within the Tongue River Member (Map 1). Separate monitoring sites located within 5 miles of the outcrops of each of these coal zones are proposed. Clusters of wells will be completed in different coal zones where outcrop areas overlap and, where present, springs will be monitored near each monitoring site. Monitoring wells will need to be completed in alluvial aquifers, in areas where water from CBM production is discharged to surface impoundments, or in selected sandstone aquifers within coal outcrop areas or CBM fields (when not required by MBOGC or the U.S. EPA). Springs that are current, historical, or potential sources of water but located away from established monitoring sites may also be monitored.

The focus of overall monitoring of the potential effects of CBM development will change as CBM fields mature, and gas production declines and eventually ends. Monitoring performed by CBM operators that is required by MBOGC or the U.S. EPA, will gradually be discontinued as portions and eventually all of fields are played out. Abandoned producing wells or monitoring wells within CBM fields should be incorporated into the regional monitoring program as field mature, in order to effectively monitor post-production groundwater recovery in affected areas.

The need for detailed information, and the cost of installing monitoring wells and monitoring ground water-levels and spring flows, will need to be balanced to determine the ultimate spacing between monitoring sites. At a minimum, one monitoring site will be located in every township that lies within 5 miles of the outcrop of a targeted coal. The ultimate spacing of monitoring sites might be greater, depending on site-specific conditions such as thickness of coal zone and importance of coal or sandstone aquifers, and priorities for monitoring outlined below.

Monitoring wells may be newly constructed wells, existing monitoring or water supply wells, or abandoned or transferred CBM production wells. Ground-water levels in monitoring wells and flows of springs will need to be measured monthly to obtain a sufficient data record to characterize patterns of seasonal changes in ground-water level or spring flows, before the wells or springs can be effected by CBM development. Typically two to three years of monitoring record is desirable. Monitoring frequency should be reduced once a sufficient record of baseline conditions is established.

Priorities

The following priorities are proposed for initiating monitoring and selecting monitoring well density and frequency, to ensure that a regional ground water monitoring program is established in advance of anticipated CBM development and before potential effects of CBM development can occur.

- *Sequence of CBM development*—Areas most likely to be affected by CBM development first are the highest priority for initiating monitoring. CBM development is expected to focus initially on the Anderson-Dietz coal zone and, therefore, monitoring near its outcrop should begin first. Records of exploration wells, pipeline plans, and identification of prospective coal zones can provide more specific information regarding the sequence of CBM development.
- *Extent of water use*—Areas where water from coal-beds is heavily used are high priorities for monitoring. Within the general area of the Anderson-Dietz outcrop, areas of concentrated water use, such as the headwaters of Otter Creek, will need immediate and more intensive monitoring.
- *Proximity to political boundaries*—Monitoring should be established along political boundaries, specifically the Montana-Wyoming border and reservation boundaries, in order to detect potential effects from areas outside the regional monitoring network.
- *Sensitivity or hydrogeologic setting*—More intensive monitoring will be necessary where

faulting or complex stratigraphy result in complex hydrogeologic settings.

- *Existing monitoring networks*—Monitoring should be re-established at monitoring wells near operating coal mines and coal mining prospects studied in the past. New monitoring well construction should focus on areas where wells are not available.

- *Land or mineral ownership*—Monitoring should be conducted at sites with stable land and/or mineral ownership. For example, federally owned land, or other land with long-term access easements provide more reliable long-term access for monitoring.

Implementation and Data Management

An important goal of the proposed regional monitoring program is to ensure that all monitoring data collected are made readily accessible to the public. The regional monitoring program can, and probably will, be conducted by more than one agency, with funding from various sources. However, one agency or interagency will need to coordinate or review all regional monitoring activities in order to assure that monitoring occurs where needed and to prevent duplication. Data from field-scale monitoring pursuant to MBOGC Order 99-99 and EPA UIC Class V injection well permits will need to be managed similarly. A further responsibility of the lead agency or group should be to ensure that regional- and field-scale monitoring data are compiled and made available to the public in the Ground-Water Information Center (GWIC) and the National Resource Information Systems (NRIS).

Summary of Recommendations

A regional-scale monitoring program is necessary to characterize baseline hydrologic conditions, to detect potential effects resulting from CBM development, and to verify recovery of ground water levels after the period of CBM development. The following constitutes the main elements of a regional-scale monitoring program that should accomplish these objectives:

- Monitoring is needed to augment and compliment field-scale monitoring established under MBOGC Order No. 99-99 and EPA UIC Class V injection permits.

- Groundwater levels need to be measured in wells in coals and overlying or underlying sandstone aquifers at locations near coal outcrops outside of areas of prospective CBM development.

- Groundwater levels need to be measured in wells in alluvial aquifers in areas where water CBM production is discharged to surface impoundments, or selected sandstone aquifers within CBM fields.

- Flows from springs need to be monitored when they are near well monitoring sites or if they are important water sources.

- Groundwater levels need to be measured in abandoned or transferred CBM wells as CBM fields mature.

- Monitoring sites need to be located in every township near coal outcrops at a minimum.

- Groundwater levels in wells and flows from springs need to be measured monthly to characterize ambient seasonal patterns.

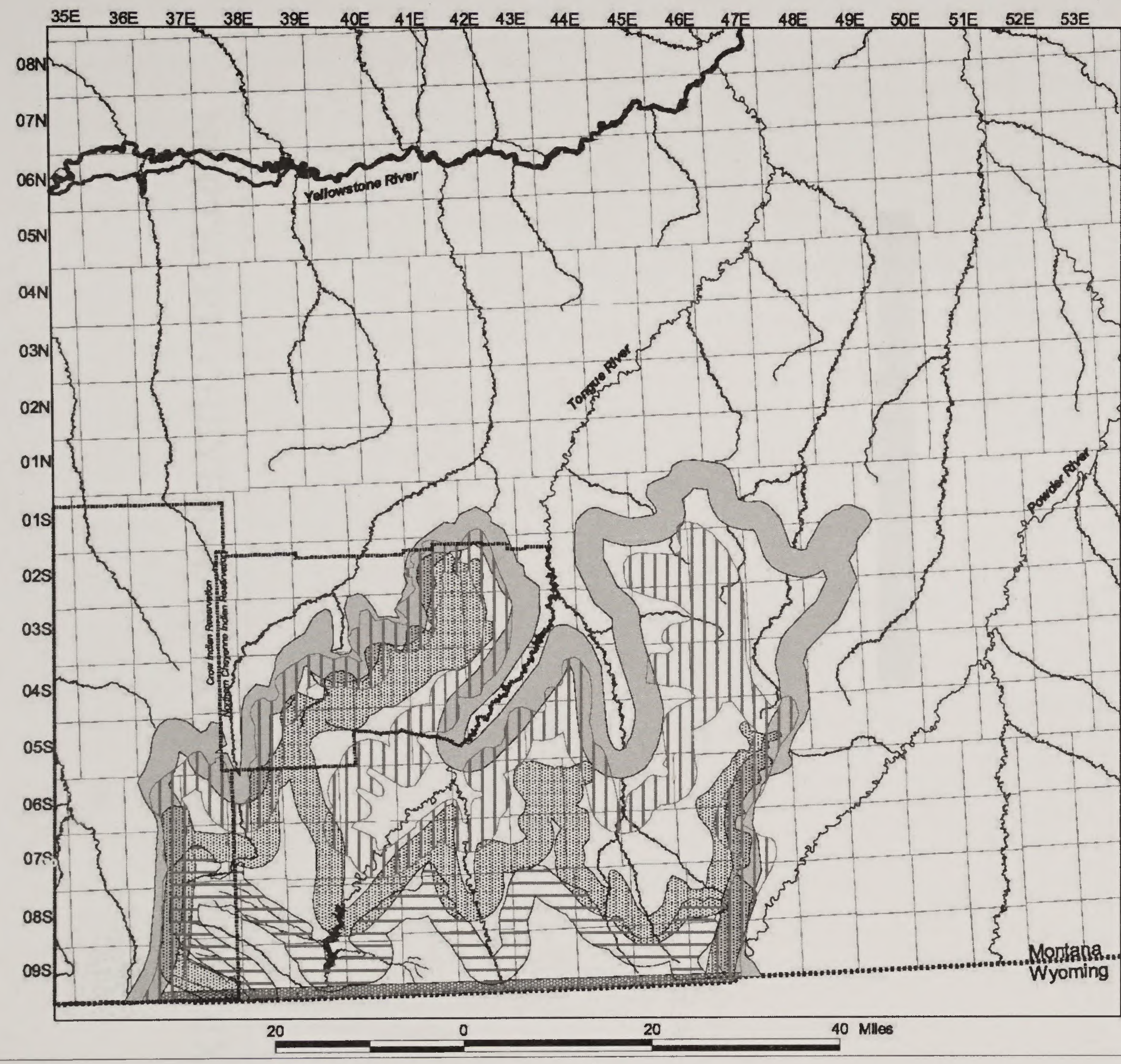
- Monitoring sites need to be established to ensure that the regional monitoring program is implemented in advance of localized CBM development and, consequently, that potential effects can be detected.

- One oversight agency or interagency group responsible for collecting and compiling comprehensive and consistent data should implement the proposed regional monitoring program.

- Monitoring data need to be compiled and made available to the public through GWIC and NRIS.

Monitoring Appendix
Map 1.
Conceptual map showing recommended areas for a regional-scale coal-bed methane monitoring program

Montana Department of Natural Resources
Technical Advisory Committee for the Powder River Basin Controlled Ground-Water Area



Legend
- Anderson
- Canyon
- Wall
- Knobloch
- State-line monitoring area

This map is part of a report prepared by the Montana Department of Natural Resources, Technical Advisory Committee for the Powder River Basin controlled ground-water area, titled: Regional-scale monitoring of potential effects of coal bed methane development on water resources. The Technical Advisory Committee proposes a minimum of 1 monitoring site in each township within three - five miles of coal outcrops. In addition, monitoring is proposed near the Montana-Wyoming border.

The Anderson, Canyon, Wall and Knobloch coal seams are the four primary seams within the Tongue River Member of the Fort Union Formation in the Montana portion of the Powder River Basin. Shaded zones represent areas that are generally 3 miles or less from these respective coal outcrops. Separate ground-water monitoring sites are proposed within each of these coal zones to study the potential effects of coal-bed methane development. Actual site locations will be based on detailed geology and field conditions.

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NORTHERN CHEYENNE MITIGATION APPENDIX

NORTHERN CHEYENNE MITIGATION APPENDIX

BLM meets its trust responsibility to protect American Indian trust resources and assets (trust resources) by first considering the potential impact of the proposed activity on identified trust resources. BLM then consults with the appropriate tribal government to obtain their comments on potential impacts to trust resources, along with possible protective measures. BLM considers the tribal government's comments and then determines what measures would be required to protect trust resources. BLM's decision has to consider, but not necessarily defer to, the comments of the tribal government on measures adequate to protect trust resources.

On August 13, 2002 the Northern Cheyenne Tribe proposed a series of mitigating measures for CBNG development under Alternative E, the preferred alternative for the Statewide document. A copy of the complete letter is available from the BLM. It is assumed that similar mitigation measures would be requested under Alternative H, and so they are addressed here. If different measures are submitted by the Northern Cheyenne, or any Native American Tribe, they will be similarly considered.

,The left hand column of the following table contains the proposed mitigating measures. The center column contains the measures BLM planned to use to protect tribal trust resources, or other area resource values of importance to the Tribe under Alternative E. The right hand column addresses these measures under Alternative H.

These mitigating measures would be imposed on operators at the APD approval stage of development as needed on a case-by-case basis; or followed by BLM on a programmatic basis. The mitigation measures would only be applied on those lands/minerals where BLM has the authority. Some of the Tribe's mitigating measures do not have corresponding mitigation proposed by BLM due to limits in BLM authorities. Such instances are noted in the table and remain as mitigation options that may be undertaken by other agencies involved in the permitting process.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
Part I, Natural Resources: **A. Protection of Reservation Groundwater**		
1. *Buffer Zone.* An initial buffer zone of 14 miles will be maintained around the Northern Cheyenne Reservation exterior boundaries. This is the minimum necessary to assure that Reservation groundwaters are not adversely affected by off-Reservation CBNG development.	If proposed development of CBNG resources is located in aquifers with hydrologic connectivity to groundwater resources of the Northern Cheyenne Reservation, the following measures would be required: The operator[1] would be required to determine the potential for proposed field development[2] to affect Reservation groundwater when CBNG production is proposed. The 14-mile buffer zone proposed by the Northern Cheyenne Tribe would not be applied. This buffer zone is based on a theoretical maximum drawdown radius assuming uniform geologic and hydrologic conditions in a 2D model. Groundwater modeling that accounts for geologic faults, irregularities, and vertical leakage was prepared for the Final EIS. The modeling predicts a drawdown radius of 4 to 5 miles (in the Hanging Woman Creek drainage). These results more accurately represent anticipated site conditions and are consistent with the Montana Department of Natural Resources (DNRC) and Conservation, Water Resources Division, Technical Advisory Committee (TAC) recommended minimum of 3-miles. This recommendation is in the TAC's guidance document for meeting the requirements of the Montana Board of Oil and Gas Conservation (MBOGC) Order No. 99-99 that requires an evaluation of pre-development ground water conditions, plus monitoring and evaluations, including procedures for monitoring and reporting the effects of CBNG development on water users. Protection of Reservation groundwater would not rely on a buffer zone. Instead, the operator would be required to conduct geologic and hydrologic evaluations for CBNG production wells to be located in areas that may have hydrologic connectivity with Reservation groundwater. When the site-specific studies triggered by the aforementioned criteria determine there would be an effect to Reservation groundwater, the operator must develop and apply measures to prevent the impact of groundwater withdrawal and monitor the effectiveness of such measures.	If proposed development of CBNG resources is located in aquifers with hydrologic connectivity to groundwater resources of the Northern Cheyenne Reservation, the following measures would be required: The operator[1] would be required to determine the potential for proposed field development[2] to affect Reservation groundwater when CBNG production is proposed. The 14-mile buffer zone proposed by the Northern Cheyenne Tribe would not be applied. This buffer zone is based on a theoretical maximum drawdown radius assuming uniform geologic and hydrologic conditions in a 2D model. Groundwater modeling that accounts for geologic faults, irregularities, and vertical leakage was prepared for the Final EIS. The modeling predicts a drawdown radius of 4 to 5 miles. Groundwater monitoring to date indicates drawdown extending approximately 1.5 miles from production fields. For proposed federal CBNG development within 5 miles of the Northern Cheyenne and Crow Indian Reservations, the BLM, in consultation with the tribes, would require site-specific groundwater and air analyses. This groundwater analysis would also address CBNG drainage issues. The operator's analyses must demonstrate that the overall POD would be protective of Indian Trust, groundwater, CBNG, and air quality. If the analysis indicated that unacceptable levels of impairment to these resources would occur and could not be mitigated in consultation with the tribes, the BLM would not approve the APDs. Additional monitoring of groundwater and air may be required within this buffer to demonstrate model adequacy.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
2. *Groundwater Monitoring.* The BLM will not issue permits to drill within the 14-mile buffer zone until sufficient hydrological information exists to clearly and convincingly demonstrate that CBNG production closer to the Reservation will not cause drawdown of Reservation groundwater resources. Prior to and in the first years of CBNG development outside the 14-mile buffer zone, BLM will conduct intensive monitoring within the 14-mile buffer zone to generate site-specific information regarding local aquifer drawdown. Monitoring wells (nested piezometers) will be installed within the buffer zone on the order of at least one cluster per township. A cluster would include well screens in appropriate coal seams, overlying aquifers, and alluvial aquifers. More monitoring wells may be necessary as development increases in the basin and/or water-level declines are observed. The monitoring wells will be located on federal land or, if possible, on private or state land by negotiation. The wells will be installed as soon as possible before production begins to ensure that adequate baseline data is available (at least three years). Water-level measurements will be obtained from each cluster at least once a month. If declining water levels are observed through monthly data collection, a continuously recording data-logger will be installed in the monitoring well to more accurately determine changing water levels. The Tribe will be privy to the design and results of this groundwater monitoring program.	For CBNG wells located in aquifers with hydrologic connectivity to Reservation groundwater, the operator would be required to conduct a geologic and hydrologic evaluation prior to field development that identifies the potential for CBNG production to affect Reservation groundwater resources. CBNG project plans must include measures to prevent the impact of CBNG production on Reservation groundwater. When determined necessary by BLM, operators would be required to install monitoring wells to verify the effect of CBNG production on Reservation groundwater resources. Specific operator monitoring plans must include a hydrologic evaluation; describe the well location(s), aquifer(s) monitored, parameters monitored, baseline data acquisition, and response actions to adverse monitoring results. All groundwater monitoring data would become public information and made available to the Tribe. BLM may approve CBNG production upon completion of the geologic and hydrologic evaluation, and installation and equipping of any required monitoring wells.	See #1 above.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
3a. *Federal Development within Buffer Zone.* Groundwater modeling based on the site-specific information generated by the above intensive monitoring program will be used by BLM in consultation with the Tribe to determine, in clear and convincing fashion, whether and to what extent federal CBNG production can occur within the 14-mile buffer zone without causing drawdown of Reservation groundwater. At least five years of intensive monitoring of the effects of CBNG production outside the buffer zone will be required before making any decision on whether to proceed with development within the buffer zone. Such decision will be made in consultation with the Tribe.	Operators would be required to prepare site-specific analysis prior to field development to determine if federal CBNG production would affect Reservation groundwater. Where this analysis shows a potential to affect Reservation groundwater, the Tribe would be consulted as to appropriate protection measures. Operators would be required to monitor the impact of CBNG production on groundwater throughout the well life and after closure, if necessary.	Within 5 miles of the Northern Cheyenne and Crow Reservations, operators would be required to prepare site-specific analysis prior to field development to determine if federal CBNG production would affect Reservation groundwater. Where this analysis shows a potential to affect Reservation groundwater, the Tribe would be consulted as to appropriate protection measures. Operators would be required to monitor the impact of CBNG production on groundwater throughout the well life and after closure, if necessary.
3b. *Federal Development within Buffer Zone.* BLM will not issue permits to drill within the buffer zone until sufficient information exists to clearly and convincingly demonstrate that such production will have no adverse effect on Reservation aquifers. Any decision to proceed with drilling within the buffer zone will be made in consultation with the Tribe and consider the likely cumulative impacts from State-authorized production of CBMCBNG resources associated with State and private lands. Authorization of federal CBNG production within the buffer zone will begin with those tracts farthest from the Reservation that have the least potential to affect Reservation groundwater.	Operators would be required to provide an analysis of the hydrologic impact of CBNG production wells and identify any potential effect to Reservation groundwater resources. The Powder River Basin Controlled Groundwater Area standards would be applied by the state, to state and private leases, and would be enforced by BLM on federal leases. Where there is a potential for affecting Reservation groundwater, monitoring plans would be developed by the operator and approved by BLM in consultation with the Tribe. Site-specific analysis would determine the timing of CBNG production adjacent to the Reservation.	Operators would be required to provide an analysis of the hydrologic impact of CBNG production wells and identify any potential effect to Reservation groundwater resources. The Powder River Basin Controlled Groundwater Area standards would be applied by the state, to state and private leases, and would be enforced by BLM on federal leases. Where there is a potential for affecting Reservation groundwater, monitoring plans would be developed by the operator and approved by BLM in consultation with the Tribe. Site-specific analysis would determine the timing of CBNG production adjacent to the Reservation.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
3c. *Federal Development within Buffer Zone.* After commencement of production, monitoring of groundwater will be expanded to verify that CBNG production does not result in any drawdown of Reservation groundwater, all in consultation with the Tribe. Prior to production, monitoring wells (nested piezometers) will be installed along the northern and eastern boundaries of the Reservation on the order of at least one cluster (see # 2, above) per adjacent township. More wells may be necessary as development increases in the basin and/or water-level declines are observed. The wells will be installed as soon as possible before development to ensure that adequate baseline data is available (at least three years). Water-level measurements will be obtained from each cluster at least once a month. If declining water levels are observed through monthly data collection, a continuously recording data logger will be installed in the monitoring well to more accurately determine changing water levels.	Operators may be required to expand their monitoring plans as production continues if a decline in Reservation groundwater levels occurs that is attributable to their operations. Operators may be required to fund or install monitoring wells on Reservation lands in order to document impacts to Tribal resources. Monitoring wells placed on the Reservation would be subject to approval by the Tribal government. All results of groundwater monitoring would become public information. Regional monitoring wells, independent of specific operators, are currently being installed by the BLM and USGS. The USGS is installing 6 well clusters along the southern boundary of the Northern Cheyenne Reservation. The BLM is installing 9 well clusters throughout the PRB study area. These regional wells would assist in identifying groundwater drawdown impacts from CBNG development. The BLM plans to install additional monitoring wells in 2003 and 2004.	Monitoring of groundwater may be required within the buffer to demonstrate model adequacy. Operators may be required to expand their monitoring plans as production continues if a decline in Reservation groundwater levels occurs that is attributable to their operations. Operators may be required to fund or install monitoring wells on Reservation lands in order to document impacts to Tribal resources. Monitoring wells placed on the Reservation would be subject to approval by the Tribal government. All results of groundwater monitoring would become public information. A regional groundwater monitoring network is being implemented by the IWG (Northern Cheyenne, USGS, MBMG, FS and BLM) which includes 226 wells and 27 springs.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
4a. *State-Authorized Development within Buffer Zone.* If, prior to the decision to proceed with Federal development of CBNG resources within the 14-mile buffer, the State authorizes CBNG development within the buffer, the Federal government will act to protect the Tribe's groundwater resources by funding the on-Reservation groundwater monitoring outlined above.	BLM would continue to participate in programs to collect data from existing monitoring wells and install additional monitoring wells to provide for monitoring of impacts to Reservation groundwater levels.	BLM would continue to participate in programs to collect data from existing monitoring wells and install additional monitoring wells to provide for monitoring of impacts to Reservation groundwater levels.
4b. *State-Authorized Development within Buffer Zone.* Prior to any state-authorized CBNG development, the BLM and other federal agencies will assist the Tribe in negotiating and obtaining agreements with the State of Montana and private landowners to protect Tribal resources from such development. Such agreements may well require: (a) installation of a hydrologic barrier consisting of a series of wells between the Reservation and developing fields that inject water into the coal seam(s) to maintain the hydrostatic pressure in the formation and prevent the depletion of groundwater; (b) provision of alternative water supplies by drilling deeper wells or conveyance of water from locations not affected by CBNG development; and (c) compensation to the Tribe and its members for any accrued damage.	The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis. The BLM would use all reasonable means to assure that Reservation groundwater is not adversely affected by off- Reservation CBNG development and that impacts to groundwater can be prevented.	The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis. The BLM would use all reasonable means to assure that Reservation groundwater is not adversely affected by off- Reservation CBNG development and that impacts to groundwater can be prevented.
5a. *Remedies for Damage to Reservation Groundwater Resources.* If monitoring wells located along the Reservation boundary detect measurable water level declines from the baseline, BLM will immediately halt any federally authorized production within the buffer zone.	BLM would require operators to modify federal CBNG production if monitoring shows production is resulting in an effect to groundwater on the Reservation. BLM requirements could include reducing production rates, shutting in the well, or requiring the operator to provide compensation to the Tribe. The operator must mitigate the impact of groundwater withdrawal prior to resuming full production.	BLM would require operators to modify federal CBNG production if monitoring shows production is resulting in an effect to groundwater on the Reservation. BLM requirements could include reducing production rates, shutting in the well, or requiring the operator to provide compensation to the Tribe. The operator must mitigate the impact of groundwater withdrawal prior to resuming full production.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
5b. *Remedies for Damage to Reservation Groundwater Resources.* The United States will also take legal action on behalf of the Tribe (or fund legal action by the Tribe) to halt any State-authorized production that is causing such water level declines on the Reservation and to obtain compensation for all accrued damage to the Tribe and its members.	The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis.	The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis.
B. Protection of Reservation CBNG Resources		
1. *CBNG Monitoring.* The groundwater monitoring described in Section I.A. will also include close monitoring of hydrostatic pressure and analysis of CBNG drainage within the buffer zone.	BLM would use its existing regulations (43 CFR 3160) to require that operators provide the production data and analysis needed for BLM to determine if drainage of Reservation CBNG is occurring.	BLM would use its existing regulations (43 CFR 3160) to require that operators provide the production data and analysis needed for BLM to determine if drainage of Reservation CBNG is occurring. The additional groundwater analysis and monitoring required within the 5-mile buffer would also assist in the analysis of the potential for Tribal CBNG drainage.
2a. *Federal Development within Buffer Zone.* BLM will not issue permits to drill within the 14-mile buffer zone until sufficient information exists to clearly and convincingly demonstrate that CBNG production will not drain Reservation methane resources. Any decision to proceed with production within the buffer zone will be made in consultation with the Tribe and consider the likely cumulative impacts on Reservation CBNG reserves from state-authorized production of state and private CBNG resources.	The BLM has a responsibility to use reasonable means to prevent drainage of Reservation CBNG from extraction on federal lands. Operators would be required to provide an analysis prior to field development in areas of potential drainage of Reservation CBNG resources. In this analysis, operators must demonstrate that CBNG production would not be likely to drain Reservation CBNG resources.	The BLM has a responsibility to use reasonable means to prevent drainage of Reservation CBNG from extraction on federal lands. Operators would be required to provide an analysis prior to field development in areas of potential drainage of Reservation CBNG resources. In this analysis, operators must demonstrate that CBNG production would not be likely to drain Reservation CBNG resources. The additional groundwater analysis and monitoring required within the 5-mile buffer would also assist in the analysis of the potential for Tribal CBNG drainage.
2b. *Federal Development within Buffer Zone.* At least five years intensive monitoring of CBNG drainage from CBNG production outside the buffer zone will be required before any decision to proceed with development within the buffer zone.	Specific evaluations would be required for CBNG wells drilled in areas that could potentially drain Reservation CBNG. Such evaluations would include modeling of CBNG reservoirs to calculate the potential for drainage of Reservation CBNG. All evaluations would be made available to the Tribe.	Specific evaluations would be required for CBNG wells drilled in areas that could potentially drain Reservation CBNG. Such evaluations would include modeling of CBNG reservoirs to calculate the potential for drainage of Reservation CBNG. All evaluations would be made available to the Tribe. The additional groundwater analysis and monitoring required within the 5-mile buffer would also assist in the analysis of the potential for Tribal CBNG drainage.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
2c. *Federal Development within Buffer Zone.* Authorization of federal CBNG production within the buffer zone will begin with those tracts farthest from the Reservation that have the least potential to drain Reservation CBNG resources.	Operators would be required to provide analysis prior to field development to determine whether and to what extent federal CBNG production would drain Reservation CBNG. The analysis would be used by BLM to determine the timing of CBNG production adjacent to the Reservation boundary in order to protect Reservation CBNG resources from drainage.	Operators would be required to provide analysis prior to field development to determine whether and to what extent federal CBNG production would drain Reservation CBNG. The analysis would be used by BLM to determine the timing of CBNG production adjacent to the Reservation boundary in order to protect Reservation CBNG resources from drainage. The additional groundwater analysis and monitoring required within the 5-mile buffer would also assist in the analysis of the potential for Tribal CBNG drainage.
2d. *Federal Development within Buffer Zone.* After commencement of production, CBNG drainage monitoring will be implemented along the Reservation boundary as provided in Section I.A. above to verify that CBNG production does not result in any drainage of Reservation methane resources.	Operators may be required to provide updated information for reservoir modeling during production in order to monitor the potential for drainage of CBNG resources from the Reservation.	Operators may be required to provide updated information for reservoir modeling during production in order to monitor the potential for drainage of CBNG resources from the Reservation. The additional groundwater analysis and monitoring required within the 5-mile buffer would also assist in the analysis of the potential for Tribal CBNG drainage.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
3a. *State-Authorized CBNG Development within Buffer Zone.* If prior to the decision to proceed with federal development CBNG resources within the 14-mile buffer, the state authorizes CBNG development within the buffer, BLM and other federal agencies will protect the Tribe's CBNG resource by funding a full characterization of Reservation CBNG resources and on-Reservation monitoring of CBNG drainage.	The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis. The BLM and the Technical Advisory Committee (TAC) are developing a regional monitoring program. Part of BLM's program during the first year of groundwater monitoring includes drilling, equipping, and testing monitoring wells adjacent to the Crow and Northern Cheyenne Reservations. The intent of the monitoring is to establish baseline data in advance of development and to determine if there are CBNG impacts to Tribal resources. The Tribe, through its efforts with the USGS, would also have baseline data through its current drilling efforts. The USGS is installing 6 monitoring well clusters along the southern Reservation boundary. The Tribe could participate as a member of the TAC in order to be involved in the process and provide recommendations for mitigation measures. The guidance document developed by the TAC within the Powder River Basin Controlled Ground Water Area (PRBCGA) would assist CBNG operators in complying with the technical requirements described in the PRBCGA Final Order and Montana Board of Oil and Gas Conservation Order No. 99-99. The PRBCGA Final Order identifies essential elements necessary for detecting and mitigating impacts from CBNG development that needs to be addressed for groundwater characterization and monitoring plans. The BLM monitoring wells are being installed in nine clusters distributed throughout the PRB, with well clusters near the southern boundary of the Northern Cheyenne Reservation in the Bull Creek and Dale Creek drainages. The BLM plans to install additional monitoring wells in 2003 and 2004.	The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis. The Water Interagency Working Group has developed a regional monitoring program. The intent of the monitoring is to establish baseline data in advance of development and to determine if there are CBNG impacts. The Tribe, through its efforts with the USGS, also has baseline data through its current drilling efforts. The guidance document developed by the TAC within the Powder River Basin Controlled Ground Water Area (PRBCGA) would assist CBNG operators in complying with the technical requirements described in the PRBCGA Final Order and Montana Board of Oil and Gas Conservation Order No. 99-99. The PRBCGA Final Order identifies essential elements necessary for detecting and mitigating impacts from CBNG development that needs to be addressed for groundwater characterization and monitoring plans. This regional monitoring of groundwater would assist in the analysis of the potential for Tribal CBNG drainage.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
3b. *State-Authorized CBNG Development within Buffer Zone.* Prior to any state-authorized CBNG development within the 14-mile buffer zone, the BLM and other federal agencies will assist the Tribe in negotiating and obtaining agreements with the State of Montana and private landowners to protect Reservation CBNG resources. Such agreements may well require: (a) installation of a hydrologic barrier consisting of a series of wells between the Reservation and developing fields that inject water into the coal seam(s) to maintain the hydrostatic pressure in the formation and prevent the drainage of CBNG, and (b) financial compensation to the Tribe or Tribal allottees for any CBNG drained from Reservation lands and any other associated damage.	The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis. In order to protect the correlative rights of the Tribe, the BLM would represent the Tribe at Montana Board of Oil and Gas Conservation (MBOGC) hearings that set spacing units for the production of CBNG resources, including state and private lands. The BLM would work with the MBOGC under its existing Memorandum of Understanding to protect Tribal resources that may be affected by state or private permits or establishment of CBNG spacing units adjacent to Tribal resources. In addition, the BLM, as a member of the technical advisory committee administered by the DNRC Water Management Division, would make recommendations to the MBOGC on the Tribe's behalf regarding monitoring requirements and mitigation of impacts.	The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis. In order to protect the correlative rights of the Tribe, the BLM would represent the Tribe at Montana Board of Oil and Gas Conservation (MBOGC) hearings that set spacing units for the production of CBNG resources, including state and private lands. The BLM would work with the MBOGC under its existing Memorandum of Understanding to protect Tribal resources that may be affected by state or private permits or establishment of CBNG spacing units adjacent to Tribal resources. In addition, the BLM, as a member of the technical advisory committee administered by the DNRC Water Management Division, would make recommendations to the MBOGC on the Tribe's behalf regarding monitoring requirements and mitigation of impacts.
4a. *Remedies for Damage to CBNG Resource.* If monitoring wells located along the Reservation boundary detect CBNG drainage, BLM will immediately halt any federally authorized production within the 14-mile buffer zone.	The interests of the Tribe would be considered prior to authorization of Federal production that may potentially drain Reservation CBNG resources. In establishing well spacing on Federal lands, protection against drainage of Reservation CBNG resources would be a priority. If monitoring or reservoir modeling indicates drainage of CBNG resources is occurring, the BLM would enter negotiations with the operator and the Tribe to protect the correlative rights of the Tribe. BLM requirements could include reducing production rates, shutting in the well, establishment of communitization agreements, or requiring the operator to pay compensatory royalty.	The interests of the Tribe would be considered prior to authorization of Federal production that may potentially drain Reservation CBNG resources. For proposed federal CBNG development within 5 miles of the Northern Cheyenne and Crow Indian Reservations, the BLM, in consultation with the tribes, would require site-specific groundwater and air analyses. The operator's analyses must demonstrate that the overall POD would be protective of Indian Trust, groundwater, CBNG, and air quality. If the analysis indicated that unacceptable levels of impairment to these resources would occur and could not be mitigated in consultation with the tribes, the BLM would not approve the APDs. In establishing well spacing on Federal lands, protection against drainage of Reservation CBNG resources would be a priority. If monitoring or reservoir modeling indicates drainage of CBNG resources is occurring, the BLM would enter negotiations with the operator and the Tribe to protect the correlative rights of the Tribe. BLM requirements could include reducing production rates, shutting in the well, establishment of communitization agreements, or requiring the operator to pay compensatory royalty.

Northern Cheyenne Tribe—Proposed Mitigation	**BLM Mitigation Measures Under Alternative E**	**BLM Mitigation Measures Under Alternative H**
4b. *Remedies for Damage to CBNG Resource.* The United States will take legal action on the Tribe's behalf (or fund legal action by the Tribe) to halt any state-authorized production that is found to be draining CBNG resources from the Northern Cheyenne Reservation and to obtain compensation for all accrued damage to the Tribe and its members.	The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis. To protect the correlative rights of the Tribe, the BLM would represent the Tribe at the MBOGC hearings that set well spacing for production of CBNG resources on state and private lands. The BLM will work with the MBOGC under its existing MOU to protect Tribal resources that may be affected by approval of state or private permits or establishment of CBNG well spacing units adjacent to Tribal resources.	The BLM recognizes its responsibility to protect tribal trust resources and would take the appropriate action(s) on a case-by-case basis. For proposed federal CBNG development within 5 miles of the Northern Cheyenne and Crow Indian Reservations, the BLM, in consultation with the tribes, would require site-specific groundwater and air analyses. The operator's analyses must demonstrate that the overall POD would be protective of Indian Trust, groundwater, CBNG, and air quality. If the analysis indicated that unacceptable levels of impairment to these resources would occur and could not be mitigated in consultation with the tribes, the BLM would not approve the APDs. To protect the correlative rights of the Tribe, the BLM would represent the Tribe at the MBOGC hearings that set well spacing for production of CBNG resources on state and private lands. The BLM will work with the MBOGC under its existing MOU to protect Tribal resources that may be affected by approval of state or private permits or establishment of CBNG well spacing units adjacent to Tribal resources.
5. *Northern Cheyenne Involvement in Monitoring and Analysis.* Training and employment will be provided to qualified and available Tribal members to involve them, to the fullest extent feasible, in all programs set forth in this Mitigation Plan to monitor and analyze effects on Reservation groundwater, CBNG resources, surface water, air quality and subsistence and cultural sites and values.	The monitoring programs sponsored by BLM are open to contracting by qualified Tribal members or companies.	The monitoring programs sponsored by BLM are open to contracting by qualified Tribal members or companies.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
C. Reservation Surface Water		
1. *Reinjection or Treatment.* All produced water from development of federal CBNG resources upstream of the Reservation in both Montana and Wyoming will either be reinjected (as provided for in DEIS Alternative B) or treated prior to discharge to meet the Northern Cheyenne Tribe's surface water quality standards (as provided in DEIS Alternative D). A special emphasis is placed on the Sodium Adsorption Ratio (SAR) and Electrical Conductivity (EC) parameters, especially during the irrigation season. Surface water flow and quality will be monitored to ensure that illegal discharges are not occurring. BLM or other federal agencies will provide the Tribe with funding to cover the costs of surface water monitoring on the Reservation.	Management of all federal produced water would be required to comply with Onshore Oil and Gas Order #7. Operators would be required to submit and receive approval of produced water management plans as part of their drilling and production plans. The water management plans would have to specify water treatment, disposal, and monitoring methods that would be followed in order to meet the state and EPA or Tribal water quality standards at the point of compliance. BLM would not approve any produced water permit applications until any necessary State, EPA, or Tribal permits required for water management actions were obtained.	Management of all federal produced water would be required to comply with Onshore Oil and Gas Order #7. Operators would be required to submit and receive approval of produced water management plans as part of their drilling and production plans. The water management plans would have to specify the methods that would be followed in order to comply with the Clean Water Act. BLM would not approve the discharge of CBNG waters to surface waters until any necessary State, EPA, or Tribal permits were obtained. The BLM would also require that untreated CBNG discharges would be cumulatively limited to 10% of the 7Q10 flow unless monitoring was occurring upstream and downstream from the outfall. If monitoring were in place the water quality thresholds identified in the monitoring appendix would be used.
2. *Effluent Guidelines and Standards of Performance.* To address discharges of CBNG production water from state-authorized development in Montana and Wyoming, EPA will promulgate effluent limitation guidelines under Section 304(b) of the Clean Water Act and/or national standards of performance for CBNG production wells under Section 306 of the Act. These standards and guidelines will require reinjection or treatment of produced water from new production wells. In addition, BLM and EPA, in conjunction with the Tribe, will encourage the states of Montana and Wyoming to negotiate a permanent agreement that includes the Tribe as a contracting party and that requires the State of Wyoming to prevent degradation of the Tongue River from Wyoming-authorized discharges.	The EPA and the state would need to determine the utility of promulgating effluent limits. The BLM would require operators to adhere to final regulations promulgated by the proper entity. The EPA and the states of Wyoming and Montana would need to determine the utility of an agreement on degradation of the Tongue River.	The EPA and the state would need to determine the utility of promulgating effluent limits. The BLM would require operators to adhere to final regulations promulgated by the proper entity. The EPA and the states of Wyoming and Montana would need to determine the utility of an agreement on degradation of the Tongue River.
D. Reservation Air Quality		

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
1. *Increment Analysis and Prevention of Significant Deterioration.* The FEIS will include a regulatory "PSD Increment Consumption Analysis" for all relevant parameters and analyze the impact of such consumption on the potential for future economic development on the Reservation. It is not acceptable to the Tribe that this analysis be done in a piecemeal fashion as CBNG wells and compressor stations are permitted. On the basis of this increment consumption analysis, BLM's record of decision must provide for a development plan that is not likely to result in significant consumption of the Reservation's PSD Class I increment for any relevant parameter.	The BLM requires permitted actions on public lands (including oil and gas development) to comply with all applicable local, state, tribal, and federal air quality laws, regulations, standards, and implementation plans. BLM does not have the responsibility or authority to conduct a regulatory PSD Increment Consumption Analysis. However, the EIS predicts the potential for certain impacts and provides that a regulatory PSD Increment Consumption Analysis be conducted by the appropriate air quality regulatory agency (i.e., the Montana DEQ or the EPA) during permitting of specific CBNG development. This analysis would assess the likelihood of an exceedance and could be used to develop conditions to prevent a significant consumption of a Class I increment if an exceedance is determined likely. Operators would be required to provide the information necessary for BLM to conduct an analysis of air quality impacts for all relevant parameters when submitting their exploration APDs or field development project plans. BLM would use the information to determine the individual and cumulative impact on the Reservation's air quality; disclose the analysis results in the appropriate NEPA document; and consult with the Tribe when the analysis shows impacts from a specific drilling or development proposal.	The BLM requires permitted actions on public lands (including oil and gas development) to comply with all applicable local, state, tribal, and federal air quality laws, regulations, standards, and implementation plans. BLM does not have the responsibility or authority to conduct a regulatory PSD Increment Consumption Analysis. However, the EIS predicts the potential for certain impacts and provides that a regulatory PSD Increment Consumption Analysis be conducted by the appropriate air quality regulatory agency (i.e., the Montana DEQ or the EPA) during permitting of specific CBNG development. This analysis would assess the likelihood of an exceedance and could be used to develop conditions to prevent a significant consumption of a Class I increment if an exceedance is determined likely. Operators would be required to provide the information necessary for BLM to conduct an analysis of air quality impacts for all relevant parameters when submitting their exploration APDs or field development project plans. BLM would use the information to determine the individual and cumulative impact on the Reservation's air quality; disclose the analysis results in the appropriate NEPA document; and consult with the Tribe when the analysis shows impacts from a specific drilling or development proposal. For proposed federal CBNG development within 5 miles of the Northern Cheyenne and Crow Indian Reservations, the BLM, in consultation with the tribes, would require site-specific air analyses. The operator's analyses must demonstrate that the overall POD would be protective of Indian Trust, and air quality. If the analysis indicated that unacceptable levels of impairment to these resources would occur and could not be mitigated in consultation with the tribes, the BLM would not approve the APDs.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
2. *Mitigation.* The BLM should implement all measures to minimize air quality degradation suggested in Alternative B of the PFEIS. These include: appropriately surfacing roads and well locations to reduce fugitive dust generated by traffic; applying dust suppressors; enforcing speed limits on all project roads; minimizing construction of roads; air quality; requiring use of natural gas-fired and electric compressors; and optimizing the number of wells connected to one compressor.	Approval of exploration APDs and field development plans would include an analysis of the individual and cumulative impacts to air quality and be conditioned to prevent violations of applicable air quality laws, regulations, and standards. Mitigating measures may include surfacing roads and well locations; applying dust suppressants; requiring operators to develop and enforce speed limits on project roads; minimizing construction of roads; requiring use of natural gas-fired and electric compressors; and optimizing the number of wells connected to one compressor.	Approval of exploration APDs and field development plans would include an analysis of the individual and cumulative impacts to air quality and be conditioned to prevent violations of applicable air quality laws, regulations, and standards. To minimize potential air impacts from CBNG operations, the number of wells connected to each compressor would be maximized, and natural-gas-fired or electrical compressors or generators would be required. To reduce dust, operators of federal leases would have to post and enforce speed limits for their employees and contractors. Operators could work with local government to use dust suppression techniques on roads. Transportation corridors would be required: proposed roads, flowline routes, and utility line routes would be located to follow existing routes, or areas of previous surface disturbance, where possible. There would be minimal road construction. Prior to approving a road, the operator, landowner, the BLM, adjacent landowners, and adjacent gas leaseholders would coordinate long-term planning for roads in the area. Discussions with affected parties would take place to help meet the transportation corridor requirement.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
3. *Monitoring.* The BLM and other federal agencies will assist the Tribe in carefully monitoring impacts to the Reservation's air quality, including consumption of the Class I increment. Air quality monitoring should be conducted on the southern and eastern boundaries of the Reservation by continuous real time monitoring systems to ensure that Class I standards are not exceeded and that substantial consumption of Class I increment is not being consumed. Areawide monitoring will also occur within the 14-mile buffer zone. The location and frequency of air-quality monitoring will be determined based on the level of production in particular areas and climatic conditions.	Operators would conduct air quality monitoring, if required, as part of their individual air quality permits issued by the applicable air quality regulatory agency. This could require monitoring of air quality on the Reservation where there is a potential for impacts. Other federal agencies, primarily EPA, should be contacted to request assistance with general monitoring of Reservation air quality.	Operators would conduct air quality monitoring, if required, as part of their individual air quality permits issued by the applicable air quality regulatory agency. This could require monitoring of air quality on the Reservation where there is a potential for impacts. Other federal agencies, primarily EPA, should be contacted to request assistance with general monitoring of Reservation air quality.
4. *Modeling.* BLM should regularly update the air quality model developed as part of the NEPA process as new data is collected within the basin. If the updated model forecasts unanticipated impacts on Reservation air quality, BLM will take corrective action to limit further CBNG development in the vicinity of the Reservation.	Operators must provide information necessary for BLM to conduct an analysis of potential air quality impacts for all relevant parameters when submitting their exploration APDs and field development plans. BLM would periodically review these air quality modeling analyses in consultation with the Tribe.	Operators must provide information necessary for BLM to conduct an analysis of potential air quality impacts for all relevant parameters when submitting their exploration APDs and field development plans. BLM would periodically review these air quality modeling analyses in consultation with the Tribe.
5. *Remedies.* If monitoring and modeling finds that off-Reservation CBNG development is causing or threatening to cause significant consumption (to be precisely defined for each relevant air quality parameter in consultation with the Tribe) of the Reservation's Class I increment for any relevant parameter, BLM will take measures to restrict the timing or location of CBNG development in the vicinity of the Reservation so that consumption of the air quality increment will be reduced to less than significant levels.	Operators in the vicinity of the Reservation may be required to restrict the timing or location of CBNG development if monitoring or modeling by the air quality regulatory authority finds their CBNG development is causing or threatening to cause non-compliance with applicable local, state, tribal, and federal air quality laws, regulations, standards, and implementation plans.	Operators within 5 miles of the Northern Cheyenne and Crow Reservation boundaries may be required to restrict the timing or location of CBNG development if monitoring or modeling by the air quality regulatory authority finds their CBNG development is causing or threatening to cause non-compliance with applicable local, state, tribal, and federal air quality laws, regulations, standards, and implementation plans.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
E. Reservation Wildlife Resources		
1. Prior to further CBNG development in the Powder River RMP area, BLM will fund a wildlife study by a contractor chosen in consultation with the Tribe that: (a) fully assesses the likely impact of off-Reservation CBNG development on the wildlife resources of the Northern Cheyenne Reservation; and (b) evaluates measures, such as establishing buffer zones and wildlife refuges to protect critical habitat, that will prevent and avoid significant impacts to Reservation wildlife resources.	The mitigating measures for wildlife are part of the standard APD review and approval process. In addition, impacts on wildlife, including those species on and adjacent to the Reservation, would be monitored and addressed per the *Wildlife Monitoring and Protection Plan* (see Wildlife Appendix). The Tribe would be invited to participate in the "steering group" that would evaluate information gathered during the inventory and monitoring phases of the *Wildlife Monitoring and Protection Plan.*	The mitigating measures for wildlife are part of the standard APD review and approval process. In addition, impacts on wildlife, including those species on and adjacent to the Reservation, would be monitored and addressed per the *Wildlife Monitoring and Protection Plan* (see Wildlife Appendix). The Tribe is active in a steering group via the Interagency Working Group to evaluate information gathered during the inventory and monitoring phases of the *Wildlife Monitoring and Protection Plan.*
2. Based on the findings of the wildlife study and in consultation with the Tribe, BLM will implement, in the form of additional RMP amendments, leasing stipulations, or operating plan conditions, all measures found necessary to fully protect Reservation wildlife resources from the impacts of off-Reservation CBNG development.	The results of the *Wildlife Monitoring and Protection Plan* would be used to adjust conditions of approval at the APD stage. This includes measures needed to protect Reservation wildlife from the impacts of CBNG development.	The results of the *Wildlife Monitoring and Protection Plan* would be used to adjust conditions of approval at the APD stage. This includes measures needed to protect Reservation wildlife from the impacts of CBNG development.
F. Noxious Weeds		
1. Operating plans will provide that vehicles and equipment associated with CBNG exploration or development must be thoroughly washed to remove seeds before passing through the Reservation. This requirement should include all personnel including operators, construction workers, contractors, and researchers.	Operators are responsible for noxious weed control on all drill pads, roads, pipelines, and other production related sites for the life of the facility. Operators would be required to include plans to prevent the spread of noxious weeds as part of their development plans. The noxious weed prevention plans must include measures to prevent the spread of weed seeds from any vehicles and equipment prior to mobilizing it to the project area (this would include contractors and researchers).	Operators are responsible for noxious weed control on all drill pads, roads, pipelines, and other production related sites for the life of the facility. Operators would be required to include plans to prevent the spread of noxious weeds as part of their development plans. The noxious weed prevention plans must include measures to prevent the spread of weed seeds from any vehicles and equipment prior to mobilizing it to the project area (this would include contractors and researchers).
2. Operating plans will provide for mandatory training of all employees and contractors in noxious weed awareness and prevention.	The Operator would be responsible for the training of employees in noxious weed awareness and prevention. Training would be one required component of the operator's noxious weed prevention plans.	The Operator would be responsible for the training of employees in noxious weed awareness and prevention. Training would be one required component of the operator's noxious weed prevention plans.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
3. Operating plans and permits to drill will require use of common corridors and minimization of roads within the development area as provided in Alternative B to the DEIS to reduce the spread of noxious weeds in the region. All development roads will be restored to the original contours and re-vegetated with the appropriate native and/or hearty vegetation. At least two years of monitoring at the abandoned production field is required to ensure that noxious weeds have not invaded the area.	Operator reclamation plans for access roads and drill sites would include recontouring to near original contour and seeding the area with a certified weed-free seed mix. Upon abandonment, revegetated areas would require at least two growing seasons before bond release in order to ensure that a self-sustaining stand of weed free vegetation had been established.	Operator reclamation plans for access roads and drill sites would include recontouring to near original contour and seeding the area with a certified weed-free seed mix. Upon abandonment, revegetated areas would require at least two growing seasons before bond release in order to ensure that a self-sustaining stand of weed free vegetation had been established.
Part II, Socioeconomic: **A. Specific Socioeconomic Mitigation Measures**		
The following *Employment Preference* [1a and 1b] will apply to all federal and state CBNG leases that include lands within 25 miles of the Reservation boundary.	The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off reservation CBNG development (see Chapter 4). The BLM does not have the authority to require operators outside the Reservation boundary to preferentially hire Native Americans.	The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off reservation CBNG development (see Chapter 4). The BLM does not have the authority to require operators outside the Reservation boundary to preferentially hire Native Americans.
la. *Employment Preference.* Indians who live on or near the Northern Cheyenne Reservation and are qualified and available ("Qualified Indians") will be given preference in recruitment, training, hiring, promotion, and reductions in work force, in all categories of employment in operations on or near the lease.	The proposed employment preferences can only be required for tribal lease operations on the Reservation. The BLM does not have the authority to require operators outside the Reservation boundary to preferentially hire Native Americans.	The proposed employment preferences can only be required for tribal lease operations on the Reservation. The BLM does not have the authority to require operators outside the Reservation boundary to preferentially hire Native Americans.

Northern Cheyenne Tribe—Proposed Mitigation	**BLM Mitigation Measures Under Alternative E**	**BLM Mitigation Measures Under Alternative H**
1b. *Employment Preference.* The employment preference will be implemented under the terms of a separate written agreement between the Tribe and the lessee. Negotiation of this agreement will commence as promptly as possible and be conducted with diligence and good faith. To expedite the negotiation, the United States, State of Montana, and Tribe will diligently and in good faith promptly concur on a Model Employment Agreement as a guide. Without limitation, the Model Employment Agreement and each Tribe-lessee agreement will include the terms and conditions set forth in i through iv below. Each Tribe-lessee agreement must be approved by the United States as to leases of federally-owned CBNG, and the state as to leases of state or privately-owned CBNG: i. Special programs for the recruitment of qualified Indians. ii. Special programs for the training of qualified Indians, including on-the-job training and training for advancement into supervisory positions. iii. Special workshops for other project work force to develop an awareness of Indian culture and concerns and an understanding of the need for and requirements of the employment preference. iv. Preservation of the lessee's authority to establish reasonable, even-handed, and job-validated training programs, employment criteria, and work rules for all employees, including qualified Indians. v. Notification to all involved labor unions of the existence of the employment preference and of the lessee's duty and intent to abide by its terms. vi. A requirement that project contractors and subcontractors assume and comply with all terms and conditions of the employment preference in connection with their own project employment practices.	The proposed employment preferences agreement can only be required for tribal lease operations on the Reservation. The BLM does not have the authority to require operators outside the Reservation boundary to enter into the employee preference agreement.	The proposed employment preferences agreement can only be required for tribal lease operations on the Reservation. The BLM does not have the authority to require operators outside the Reservation boundary to enter into the employee preference agreement.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
2. The following *Contracting Preference* (2a and 2b) will apply to all federal and state CBNG leases that include lands within 25 miles of the Reservation boundary.	The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off-Reservation CBNG development (see Chapter 4). The BLM does not have the authority to require operators outside the Reservation boundary to preferentially contract with Northern Cheyenne Contractors.	The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off-Reservation CBNG development (see Chapter 4). The BLM does not have the authority to require operators outside the Reservation boundary to preferentially contract with Northern Cheyenne Contractors.
2a. Businesses that are majority-owned and controlled by the Northern Cheyenne Tribe and/or its members ("Northern Cheyenne Contractors") will be given preference in the awarding of all contracts and subcontracts for the conduct of operations on or near the lease, and for the procurement of material and equipment for such operations.	The proposed contracting preferences can only be required for tribal lease operations on the Reservation. The BLM does not have the authority to require operators outside the Reservation boundary to preferentially contract with Northern Cheyenne Contractors.	The proposed contracting preferences can only be required for tribal lease operations on the Reservation. The BLM does not have the authority to require operators outside the Reservation boundary to preferentially contract with Northern Cheyenne Contractors.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
2b. These preferences will be implemented under the terms of a separate written agreement between the Tribe and the lessee. Negotiation of this agreement will commence as promptly as possible and be conducted with diligence and good faith. To expedite the negotiation, the United States, State of Montana, and Tribe will diligently and in good faith promptly concur on a Model Contracting Agreement as a guide. Without limitation, the Model Contracting Agreement and each Tribe-lessee agreement will include the terms and conditions set forth in i through iii below. Each Tribe-lessee agreement must be approved by the United States as to leases of federally-owned CBNG, and the state as to leases of state or privately-owned CBNG: i. A fair and objective procedure under which a business entity applying for the status of Northern Cheyenne Contractor must be certified in the following two respects: (1) as an entity actually majority-owned and controlled by the Tribe and/or a Tribal member; and (2) as an entity capable of competently providing particular contract services or supplying particular material or equipment. ii. Advance notice to certified Northern Cheyenne Contractors of service or procurement contracts to be awarded for which they are qualified. iii. A requirement that project contractors and subcontractors assume and comply with all terms and conditions of these preferences in connection with their own project contracting and procurement practices.	The proposed contracting preferences agreement can only be required for tribal leases issued for operations on the Reservation. The BLM does not have the authority to require operators outside the Reservation boundary to enter into the contracting preference agreement.	The proposed contracting preferences agreement can only be required for tribal leases issued for operations on the Reservation. The BLM does not have the authority to require operators outside the Reservation boundary to enter into the contracting preference agreement.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
3. *Law and Order; Traffic.* The following (3a thru 3e) will apply to all federal and state CBNG leases that include lands within Rosebud, Powder River and Bighorn Counties.	The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off-Reservation CBNG development (see Chapter 4). The BLM does not have the authority to require law and order adherence covenants from operators for off- Reservation CBNG development. Compliance with applicable traffic laws is necessary for all individuals and companies when operating on public roads within the Reservation.	The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off-Reservation CBNG development (see Chapter 4). The BLM does not have the authority to require law and order adherence covenants from operators for off-Reservation CBNG development. Compliance with applicable traffic laws is necessary for all individuals and companies when operating on public roads within the Reservation.
3a. The lessee will obtain a covenant from each of its employees that while on the Reservation for any purpose, the employee will comply with all standards of conduct generally applicable to Tribal members.	The proposed covenant can only be required for tribal leases issued for operations on the Reservation. The BLM does not have the authority to require lessees outside the Reservation boundary to require their employees to sign the general conduct covenant.	The proposed covenant can only be required for tribal leases issued for operations on the Reservation. The BLM does not have the authority to require lessees outside the Reservation boundary to require their employees to sign the general conduct covenant.
3b. Each lessee will obtain a covenant from each of its truckers that while operating on the Reservation, the trucker will comply with all laws, ordinances and rules applicable to the use of motor vehicles by Tribal members.	The proposed covenant can only be required for tribal leases issued for operations on the Reservation. The BLM does not have the authority to require lessees outside the Reservation boundary to require their truckers to sign the traffic covenant.	The proposed covenant can only be required for tribal leases issued for operations on the Reservation. The BLM does not have the authority to require lessees outside the Reservation boundary to require their truckers to sign the traffic covenant.
3c. Each lessee will by contract require (i) each of its contractors and subcontractors to obtain like covenants from their employees and truckers, and (ii) each of its suppliers to obtain a like covenant from their truckers.	The proposed covenant can only be required for tribal leases issued for operations on the Reservation. The BLM does not have the authority to require lessees outside the Reservation boundary to require their contractors and subcontractors to sign a covenant.	The proposed covenant can only be required for tribal leases issued for operations on the Reservation. The BLM does not have the authority to require lessees outside the Reservation boundary to require their contractors and subcontractors to sign a covenant.
3d. The above described duties imposed on employees and truckers will be enforced by each lessee, and its contractors, subcontractors, and suppliers, by taking appropriate employee-related disciplinary action in the event such duties are violated.	The BLM does not have the authority to require lessees outside the Reservation boundary to discipline individual employees.	The BLM does not have the authority to require lessees outside the Reservation boundary to discipline individual employees.

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3e. These provisions will be implemented under the terms of a separate written agreement between the Tribe and each lessee. Negotiation of this agreement will commence as promptly as possible and be conducted with diligence and good faith. To expedite the negotiation, the United States, State of Montana, and Tribe will diligently and in good faith promptly concur on a Model Law and Order/Traffic Agreement as a guide. Without limitation, the Model Law and Order/Traffic Agreement and each Tribe-lessee agreement will include the term and conditions set forth in i through v below. Each Tribe-lessee agreement must be approved by the United States as to leases of federally-owned CBNG, and the state as to leases of state or privately-owned CBNG: i. Assumption in writing by each employee and trucker of the conditions set forth in a through d above. ii. Education of employees and truckers with respect to the standards of conduct they must observe while on the Reservation. iii. Appropriate employee-related disciplinary action for particular violations. iv. Resolution of disputes concerning the occurrence of violations. v. Notification to all involved labor unions of the existence of the written agreement and the lessee's duty and intent to abide by its terms.	The proposed agreement can only be required for tribal leases issued for operations on the Reservation. The BLM does not have the authority to require lessees outside the Reservation boundary to require their contractors and subcontractors to sign the written agreement.	The proposed agreement can only be required for tribal leases issued for operations on the Reservation. The BLM does not have the authority to require lessees outside the Reservation boundary to require their contractors and subcontractors to sign the written agreement.
4. *Impact Funding.* The Tribe proposes the following impact funding program described in 4a through 4e.	The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off-reservation CBNG development (see Chapter 4). The BLM does not have the authority to require impact funding.	The BLM has a responsibility to examine the socioeconomic impacts on the Northern Cheyenne Tribe from off-reservation CBNG development (see Chapter 4). The BLM does not have the authority to require impact funding.
4a. The Federal government	Of the monies received from sales, bonuses,	Of the monies received from sales,

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
returns 50% of all CBNG lease bonuses, rentals and royalties to the state ("Off-Reservation Federal Impact Funds"). By federal statute, these funds are to be used to mitigate socioeconomic impacts of CBNG development on local communities. In the region, these impacts can be expected to occur in Big Horn, Rosebud, and Powder River Counties (the "Three County Area"), both on and off the Reservation. No portion of the off-Reservation Federal Impact Funds will be made available to the Tribe.	and royalties on federal public domain leases, 50% is returned to the state or its governmental subdivisions where the leases are located. The state legislature is the body that controls disposition of the monies received and determines the priority of fund distribution to those subdivisions economically impacted by development. BLM does not have the discretion or authority to redistribute federal royalties.	bonuses, and royalties on federal public domain leases, 50% is returned to the state or its governmental subdivisions where the leases are located. The state legislature is the body that controls disposition of the monies received and determines the priority of fund distribution to those subdivisions economically impacted by development. BLM does not have the discretion or authority to redistribute federal royalties.
4b. The Tribe will be provided with a degree of proportionate funding.	Of the monies received from sales, bonuses, and royalties on federal public domain leases, 50% is returned to the state or its governmental subdivisions where the leases are located. The state legislature is the body that controls disposition of the monies received and determines the priority of fund distribution to those subdivisions economically impacted by development. BLM does not have the discretion or authority to redistribute federal royalties.	Of the monies received from sales, bonuses, and royalties on federal public domain leases, 50% is returned to the state or its governmental subdivisions where the leases are located. The state legislature is the body that controls disposition of the monies received and determines the priority of fund distribution to those subdivisions economically impacted by development. BLM does not have the discretion or authority to redistribute federal royalties.
4c. The impact funding will be provided to the Tribe for the exclusive purpose of planning and providing public services and facilities on the Reservation.	Of the monies received from sales, bonuses, and royalties on federal public domain leases, 50% is returned to the state or its governmental subdivisions where the leases are located. The state legislature is the body that controls disposition of the monies received and determines the priority of fund distribution to those subdivisions economically impacted by development. BLM does not have the discretion or authority to redistribute federal royalties.	Of the monies received from sales, bonuses, and royalties on federal public domain leases, 50% is returned to the state or its governmental subdivisions where the leases are located. The state legislature is the body that controls disposition of the monies received and determines the priority of fund distribution to those subdivisions economically impacted by development. BLM does not have the discretion or authority to redistribute federal royalties.
4d. The funding will be calculated by taking the amount of off-Reservation Federal Impact Funds generated by all federal CBNG leases that lie in whole or in part in the Three County Area, dividing by the off-Reservation resident population of the Three County Area, and then multiplying by the resident population of the Reservation.	The BLM does not have the authority to redistribute the federal royalties.	The BLM does not have the authority to redistribute the federal royalties.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
4e. The funding will be provided to the Tribe at the same time that the off-Reservation Federal Impact Funds are provided to the state.	The BLM does not have the authority to redistribute the federal royalties.	The BLM does not have the authority to redistribute the federal royalties.
4f. There are several possible sources for the impact funding, including without limitation the following and combinations thereof: (1) entirely from the lessees, via lease stipulations, permit conditions or operating plans; (2) from the lessees, but at no cost to the lessees, through exercise of the Secretary's existing authority under 30 USC §209 to grant royalty reductions to lessees, accompanied by a commitment from the lessees to pay to the Tribe an amount equal to the royalty reductions; (3) from the 50% share of the federal lease bonuses, rents, and royalties retained by the United States. Presumably, this will require federal legislation.	The BLM does not have the authority to require impact funding. A royalty rate reduction cannot be legally granted to the lessees to offset payments by the lessees for impact funding. The BLM does not have the authority to redistribute the federal royalties.	The BLM does not have the authority to require impact funding. A royalty rate reduction cannot be legally granted to the lessees to offset payments by the lessees for impact funding. The BLM does not have the authority to redistribute the federal royalties.
Part III, Cultural: **A. Protection of Northern Cheyenne Homesteads**		
A buffer zone should be established around the Northern Cheyenne homestead sites in the Otter Creek and Hanging Woman drainages. Since current archaeological survey data is inadequate to identify all these sites, all sections where land records indicate Northern Cheyenne homesteading activity took place should be withheld from CBNG exploration and development. These sections are identified in Appendix G to the Tribe's Narrative Report.	Operators would be required to include review of Northern Cheyenne homestead records and evaluation for homesteads in the cultural resource surveys where land records indicate Northern Cheyenne homesteading activity. Specific measures to mitigate impacts to these homesteads would be developed at the APD approval phase. A review of land and mineral ownership maps indicate that one homestead location listed in Appendix C of the Ethnographic Report may be located on an area open to fluid mineral leasing. The location is on split estate with private surface and federal minerals. Prior to any land disturbing activity permitted by the BLM in this location, and with landowner permission, BLM would work with the Northern Cheyenne Tribe and the operator to develop the requirements for inventorying, recording, and evaluating the homestead site. BLM would provide technical assistance to the Tribe in inventorying, recording, and evaluating the homestead site.	Operators would be required to include review of Northern Cheyenne homestead records and evaluation for homesteads in the cultural resource surveys where land records indicate Northern Cheyenne homesteading activity. Specific measures to mitigate impacts to these homesteads would be developed at the APD approval phase. A review of land and mineral ownership maps indicate that one homestead location listed in Appendix C of the Ethnographic Report may be located on an area open to fluid mineral leasing. The location is on split estate with private surface and federal minerals. Prior to any land disturbing activity permitted by the BLM in this location, and with landowner permission, BLM would work with the Northern Cheyenne Tribe and the operator to develop the requirements for inventorying, recording, and evaluating the homestead site. BLM would provide technical assistance to the Tribe in inventorying, recording, and evaluating the homestead site.
B. Protection of Significant Hunting, Fishing and Plant Gathering Areas in Tongue River Valley		

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
The 14-mile buffer zone proposed by the Tribe to protect Reservation groundwater resources should be adequate to protect culturally significant plant gathering areas within the Tongue River valley. However, if CBNG development is authorized within the buffer zone, the following protocols should be followed:	Development is presumed to occur at some future time within the 14-mile area.	Development is presumed to occur at some future time within the 14-mile area.
1. No development will be permitted up to five miles cast of the Tongue River between Ashland and Birney without mitigation measures designed to avoid disturbance of important hunting, fishing, and plant gathering sites.	In the area east of the Tongue River between Ashland and Birney, with important hunting, fishing, and plant gathering sites, operators would be required to inventory BLM lands for traditional plant gathering sites around the proposed drilling locations. APD approvals may include avoidance or timing restrictions to prevent impacts to identified important hunting, fishing and plant gathering sites.	In the area east of the Tongue River between Ashland and Birney, with important hunting, fishing, and plant gathering sites, operators would be required to inventory BLM lands for traditional plant gathering sites around the proposed drilling locations. APD approvals may include avoidance or timing restrictions to prevent impacts to identified important hunting, fishing and plant gathering sites.
2. BLM operating plans will require that prior to development in areas within five miles (east) of the Tongue River between Ashland and Birney, the project proponent and BLM will consult with the Northern Cheyenne Cultural Commission to determine the location of any important hunting, fishing, and plant gathering sites. The BLM, in consultation with the Tribes Cultural Commission, will design measures to avoid disturbance of these important areas.	In the area east of the Tongue River between Ashland and Birney, operators would be required to consult with the Northern Cheyenne Cultural Commission to determine the location of any important hunting, fishing, and plant gathering sites. APD approvals would include measures to avoid impacts to these resources using standard terms and conditions.	In the area east of the Tongue River between Ashland and Birney, operators would be required to consult with the Northern Cheyenne Cultural Commission to determine the location of any important hunting, fishing, and plant gathering sites. APD approvals would include measures to avoid impacts to these resources using standard terms and conditions.
3. No permits to drill will be issued within three miles of Poker Jim Butte to protect an important medicinal and ceremonial plant gathering area in that location.	Operators would be required to conduct a plant inventory on BLM lands proposed for disturbance near Poker Jim Butte. Impacts on medicinal and ceremonial plant gathering areas could then be mitigated using standard terms and conditions. **Note**: The butte is within the Custer National Forest.	Operators would be required to conduct a plant inventory on BLM lands proposed for disturbance near Poker Jim Butte. Impacts on medicinal and ceremonial plant gathering areas could then be mitigated using standard terms and conditions. **Note**: The butte is within the Custer National Forest (Forest Service administration).

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
4. BLM will monitor the effects to the Northern Cheyenne subsistence economy from CBNG development by funding annual updates to the Tribe's subsistence survey (Northern Cheyenne Tribe 2002). A Wildlife Technical Working Group, whose membership will include Northern Cheyenne and agency wildlife specialists, will routinely review the subsistence data of each year. On the basis of this data, they should recommend changes in leasing stipulations to curtail any noted deleterious effects to Northern Cheyenne subsistence hunting, fishing, and plant gathering. This group will also review all reclamation plans to ensure that habitat diversity around the Reservation is maintained and plants with traditional cultural uses are included in the revegetation seed mixes.	BLM would welcome the participation of the Northern Cheyenne in the "steering group" that would evaluate information gathered during the inventory mid monitoring phases of the Wildlife Monitoring and Protection Plan.	BLM and the Tribe are active in the steering group via the Interagency Working Group to evaluate information gathered during the inventory mid monitoring phases of the Wildlife Monitoring and Protection Plan.
C. Protection of Culturally Important Springs		
1. The BLM will inventory springs off the Reservation within the 14-mile buffer zone. This will include locating springs by GPS, determining the source of the water, measuring the flow, monitoring water quality parameters, and documenting vegetation growth and condition with photos and video. A comprehensive spring inventory should be conducted at least twice per year.	Operators would be required to inventory all springs supplied by the coal seam producing CBNG within the anticipated drawdown radius of their proposed operation.	Operators would be required to inventory all springs supplied by the coal seam producing CBNG within the anticipated drawdown radius of their proposed operation. Additionally the IWG has developed a Regional Groundwater Monitoring Plan, which includes springs (see monitoring appendix).
2. If development is allowed within the 14-mile buffer, no permits to drill will be issued within three miles of an inventoried spring prior to consultation with the Northern Cheyenne Cultural Commission regarding the cultural significance of the spring to the Tribe.	The Northern Cheyenne Cultural Commission would be consulted about the appropriate mitigation if culturally significant springs were located within the anticipated drawdown radius of the operator's proposed development.	The Northern Cheyenne Cultural Commission would be consulted about the appropriate mitigation if culturally significant springs were located within the anticipated drawdown radius of the operator's proposed development.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
3. Springs that are identified by the Cultural Commission as having special significance to the Northern Cheyenne will be protected by a buffer zone adequate to protect medicinal and ceremonial plants as well as the spiritual beings that inhabit the springs and maintain the current conditions that facilitate traditional cultural use of the springs for prayer, offerings, and ceremonies. The size and shape of the buffer zone will be determined by BLM, in consultation with the Tribe based on the best available hydrological data.	Operators may be required to avoid impacting culturally significant springs as part of the mitigation plan developed under Section 106 of the National Historic Preservation Act.	Operators may be required to avoid impacting culturally significant springs as part of the mitigation plan developed under Section 106 of the National Historic Preservation Act.
4. Where drilling is allowed within three miles of a culturally important spring, BLM will monitor the drawdown of aquifers related to the spring on a systematically scheduled basis and provide timely reports of the monitoring data to the Tribe. The Northern Cheyenne Tribe will be full participants in a Technical Working Group that oversees the monitoring. (It could be most cost efficient to have the Northern Cheyenne collect this data and distribute it to all interested parties).	Operators could be required to monitor the condition of culturally significant springs where there is the potential for production activities to impact the springs. This requirement would be triggered by the results of the site specific hydrologic evaluation associated with the APD approval.	Operators could be required to monitor the condition of culturally significant springs where there is the potential for production activities to impact the springs. This requirement would be triggered by the results of the site specific hydrologic evaluation associated with the APD approval.
5. In keeping with the best adaptive management practices, the BLM will halt pumping CBNG production around culturally important springs if monitoring data indicates that dewatering of the spring is occurring or imminent.	Operators must modify federal CBNG production if monitoring data shows production is affecting culturally important springs. The operator must implement mitigating measures that would maintain the spring flow prior to resuming full production.	Operators must modify federal CBNG production if monitoring data shows production is affecting culturally important springs. The operator must implement mitigating measures that would maintain the spring flow prior to resuming full production.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
D. Protection of Grave Sites		
To protect grave sites, BLM should not issue permits to drill within a mile of all Tribal burials, graves, or cemeteries (regardless of temporal or Tribal affiliation).	Operators would be required to have a discovery plan as part of their plan of development. The discovery plan would include suspension of operations and notification requirements for state, private, and federal lands in the event human remains are discovered during project construction. Should human remains be discovered during construction, BLM would consult with the Northern Cheyenne on the appropriate distance between the project and gravesite.	Operators would be required to have a discovery plan as part of their plan of development. The discovery plan would include suspension of operations and notification requirements for state, private, and federal lands in the event human remains are discovered during project construction. Should human remains be discovered during construction, BLM would consult with the Northern Cheyenne on the appropriate distance between the project and gravesite.
E. Prevention and Mitigation of Impacts to Northern Cheyenne Cultural Resources		
1. BLM will support (by providing funding, training, and in kind services) the creation of a Tribal Historical Preservation Office (THPO). The THPO will focus on Tribal culture, history, geography, and related research, and on building a Northern Cheyenne Archive. The THPO will be a clearinghouse for cultural resource information and the development of a public outreach program and education program for all grade levels in local schools.	BLM supports the creation of a Northern Cheyenne Tribal Historic Preservation Office. This would need to be done through the National Park Service. BLM cannot commit to funding the office. BLM would share data with the THPO from cultural resource investigations associated with CBNG development. This information could then be used for tribal educational and outreach efforts.	BLM supports and coordinates with the Northern Cheyenne Tribal Historic Preservation Office. BLM cannot commit to funding the office. BLM shares data with the THPO from cultural resource investigations associated with CBNG development. The information can be used for tribal educational and outreach efforts.
2. Mechanisms will be established to enable the Tribe to monitor all site-specific cultural resource work done for CBNG development to ensure that all Tribally affiliated properties are recorded and evaluated in a culturally appropriate fashion. This should include, but not necessarily be limited to, the respectful treatment of human remains, items of cultural patrimony, and materials relating to ongoing traditional cultural uses of sites (e.g., offering cloths, etc.).	When tribally affiliated properties would be affected by CBNG developments, BLM may require a tribal monitor. Under most normal circumstances, cultural resource work does not require a monitor.	When tribally affiliated properties would be affected by CBNG developments, BLM may require a tribal monitor. Under most normal circumstances, cultural resource work does not require a monitor.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
3. All Tribally affiliated properties will be evaluated under the National Historic Preservation Act in accordance with NPS Bulletins 15, 16 and 38. Bulletin 38 evaluations must include face-to-face contacts with Northern Cheyenne cultural resource specialists, culture historians and/or culture committee members. Evaluations will include specific discussions of Cheyenne history and culture as well as scientific values.	All cultural properties recorded as a result of CBNG related activities would be evaluated for listing on the National Register of Historic Places. BLM would consult with the Northern Cheyenne Tribe when properties were evaluated as Traditional Cultural Properties.	All cultural properties recorded as a result of CBNG related activities would be evaluated for listing on the National Register of Historic Places. BLM would consult with the Northern Cheyenne Tribe when properties were evaluated as Traditional Cultural Properties.
4. Cultural resource contractors hired by the BLM or project proponents and BLM archaeologists will demonstrate good faith consultation with the Tribe and make every attempt to include Cheyenne cultural resource specialists in all aspects of their work.	This is a current requirement by BLM for both themselves and BLM cultural resource permit holders.	This is a current requirement by BLM for both themselves and BLM cultural resource permit holders.
5. Cultural resource technical reports approved by the BLM will follow current best practice standards and be accompanied by public narratives suitable for use in Northern Cheyenne schools.	BLM's report standards are found in the BLM's 8100 Manual and Handbooks and are augmented by current professional standards. When reports contain data that would be of interest to the Tribe or the public, BLM may require the operator's consulting archaeologist to prepare a public narrative of their work.	BLM's report standards are found in the BLM's 8100 Manual and Handbooks and are augmented by current professional standards. When reports contain data that would be of interest to the Tribe or the public, BLM may require the operator's consulting archaeologist to prepare a public narrative of their work.
6. Treatment plans for historic properties (eligible sites) will always give the highest priority to avoidance when the property is eligible as a Traditional Cultural Property (under Bulletin 38). If a site is eligible, only for its scientific value, mitigation through data recovery may be considered if the site can not be avoided. Training opportunities for the Cheyenne in archaeological excavation techniques and/or public awareness programs for Northern Cheyenne students will accompany any excavation of tribally affiliated sites.	Avoidance is BLM's standard policy for not adversely affecting historic properties. BLM would consult with the Northern Cheyenne Tribe for sites that are found eligible as a Traditional Cultural Property.	Avoidance is BLM's standard policy for not adversely affecting historic properties. Operators would have to consult with affected tribes when proposing actions near American Indian traditional cultural properties, such as the Rosebud Battlefield and the Wolf Mountains Battlefield. Consultation might result in mitigation of impacts to traditional cultural properties.

Northern Cheyenne Tribe—Proposed Mitigation	BLM Mitigation Measures Under Alternative E	BLM Mitigation Measures Under Alternative H
7. All well locations and ancillary facilities (roads, pipelines, etc.) that cause ground disturbance will be intensively inventoried for cultural resources. Cultural resources include archaeological sites, plant collecting areas, paint sources, baculite sources, and earthlodges (sacred hills), and bird habitats, e.g., nesting area of birds who participate in Northern Cheyenne ceremonial life. This will require Northern Cheyenne participation in the survey effort to identify paint, plant, and earthlodge sites.	Inventory of well locations and ancillary facilities is a current requirement prior to surface disturbance. Inventory strategies would be discussed as part of the cultural resources section of plans of development.	Inventory of well locations and ancillary facilities is a current requirement prior to surface disturbance. Inventory strategies would be discussed as part of the cultural resources section of plans of development.
8. Since CBNG development, if permitted, could cause a cumulatively significant amount of ground disturbance, the various site-specific reports should be compiled and the data synthesized into an over-riding and undatable technical document at the end of each field season. In keeping with modern adaptive management strategies, this synthesis will be reviewed by a Cultural Resources Technical Working Group (CRTWG), which should include Northern Cheyenne culture historians/elders and/or Tribal Historical Preservation officers designated by the Tribe along with agency cultural resource specialists.	BLM would provide the Tribe a copy of BLM's annual cultural resources report, which would summarize CBNG related cultural resource activities. BLM would participate in the Cultural Resources Working Group.	BLM currently provides the Tribe a copy of BLM's annual cultural resources report, which summarizes CBNG related cultural resource activities. BLM would participate in the Cultural Resources Working Group.
9. A $300 filing fee will be included in the cultural resource contracts. This filing fee will be allocated to the Northern Cheyenne Tribe for the development and support of the THPO.	The authorities under which BLM currently issues cultural resource use permits and fieldwork authorizations do not provide for the collection of fees.	The authorities under which BLM currently issues cultural resource use permits and fieldwork authorizations do not provide for the collection of fees.

[1] "Operator" refers to "oil and gas" operator.
[2] Field development refers to operator requests for approval of additional wells other than in accordance with current spacing (1 well per 640 acres/coal seam).

SOCIOECONOMICS APPENDIX

SOCIOECONOMICS APPENDIX

Attitudes, Beliefs, Lifestyles, and Values

Population Groups

General information about population groups was developed from a number of sources, including the documents cited in the text. While the generalized characterizations are not likely to apply to all individuals, the intention is to provide an idea of the range of the attitudes and lifestyles of the population subgroups present in the study area.

The study area population is largely rural, with strong ties to the land and to the many small towns. Ranch and farm families are one of the major groups of people living in the study area. They tend to favor traditional land uses and the preservation of intergenerational family operations. They may feel reluctance toward short-term developments that will alter their lifestyle. The study area population also includes long-time small town residents. While these people generally wish to maintain their way of life, at the same time, some may seek to find a compromise between their current situation and gradual development.

Another portion of the population in the study area is Native Americans, many of whom are residents of the three Indian reservations within the study area. These groups generally desire to preserve many elements of their heritage and do not wish to become homogenized into and by the non-Indian culture. At the same time, some tribal members or subgroups are pursuing the development of energy resources for the long-term social and economic betterment of tribal members.

A small but growing population is made up of professionals, craftspeople, retirees, and others who have moved to small towns to enjoy the slower pace of life and various amenities. While the forested areas of western Montana tend to attract more of this group than eastern Montana, these people are present in the study area as well. They may participate in opposition to development proposals that appear to jeopardize the quality of their new lifestyles.

Areas where energy resources are developed often see the influx of people from other areas. Many of these people regard their employment as temporary, expect to move on to other areas, and do not play an integral part in community affairs. Long-term local residents often resent these “outsiders” while at the same time realizing some economic benefits from the business and service demands of these newcomers.

In summary, residents generally value the rural character of their lifestyle. Specific aspects of this lifestyle might include appreciation of wide-open spaces, natural landscape, fresh air and solitude. The lifestyle of rural communities often offers the desirable qualities of neighbors knowing each other, lack of urban problems, relaxed pace, personal freedom, and being a good place to raise children. Longtime residents often want to see continued control of the land at the local level without interference from outside agencies or groups.

Public Comments from EIS Scoping Process (2001)

The public comments received during the Statewide Document scoping process convey important information about general attitudes toward coal bed natural gas (CBNG) and other energy or mineral development. The vast majority of public comments received during scoping relayed concerns about potential impacts on water quality and quantity. Specifically, commentators were concerned with the discharge of water of poor quality (e.g., saline) and the drawdown of groundwater aquifers.

Public comments are often shaped by an individual’s lifestyle and livelihood. For example, ranching and irrigated agriculture are both dependent on the supply of water. Of the comments received by individuals engaged in farming and ranching, a great many related to concerns about potential degradation of water quality and quantity, in addition to general environmental impacts. The comments reflect a tension between the desire for new development to support the often stagnant rural economies and the concern that such development could harm the environment and the lifestyle qualities for which Montana is known, including natural beauty, wide-open spaces, and solitude.

In general the comments reflect a difference in attitudes toward CBNG development among those individuals and organizations that might profit directly from CBNG and those that would not. Those who own land or mineral rights where CBNG could be developed tend to favor cautious and prudent development for the economic benefits it could bring to them and the local economies. Some who do not stand

to benefit directly also favor responsible CBNG development as soon as possible, believing the economic benefits are needed urgently to bolster stagnant or failing local economies and in turn help maintain existing rural lifestyles. Particularly in the less affluent portions of the study area, CBNG and other resource development may be seen as one of the few means to meet urgent human needs in the form of employment and income.

Other individuals, including those who do not stand to benefit directly from CBNG, are concerned that the quality of their life and the environment will be adversely affected; that local benefits will be minor; and that most of the benefits will accrue to outsiders. There is a perception that such outside developers, or "wildcatters," will move into a community, extract the profits, and leave a despoiled environment behind. Rural residents, including those in small developments or neighborhoods, are generally concerned about the potential for CBNG development in adjacent areas to disturb the peaceful and pristine setting, to contribute unsightly development, to disturb wildlife, and to threaten the provision of adequate public services.

There is also a perception from some comments that CBNG will adversely affect the lifestyles of the Native Americans living in and around the 13-county Planning Area—particularly those on the reservations. Concerns reflect the traditional high value placed on natural resources by these groups, the importance of existing water and other natural resources in tribal economies and cultures, and the opinion that tribal members will be unduly burdened with the costs of development while not receiving many or any benefits.

Public Comments from SEIS Scoping Process (2005)

Scoping comments received in the summer of 2005 reflect similar concerns about and support for CBNG development as those expressed during scoping for the Statewide Document. In addition, there was a concern that delayed or phased development would create economic impacts. Specifically, lessees and lessors would lose revenue due to leasing and permitting delays and the state would have a net present value loss in income and payroll taxes, as well as production taxes and royalties. There were also concerns about the displacement of wildlife to livestock grazing tracts, the subsequent interference with livestock grazing, and the potential effect on sub-irrigated tracts.

Newspaper Reports

One of the largest newspapers in the Planning Area, the *Billings Gazette*, was reviewed for information about local attitudes and concerns related to the socioeconomics of CBNG. During the week of February 19, 2001, the *Billings Gazette* presented an in-depth report on CBNG development in Wyoming and Montana. While the series was running, readers were invited to register their opinions about the positive and negative aspects of CBNG in the Powder River Basin. Because this was not a scientific or statistical survey, the responses are likely to be biased toward those who had a concern or issue to communicate.

Of the 154 responses received, 94 agreed with the statement, "Coal bed methane development will be detrimental to Montana's environment and shouldn't be developed here." Thirty-seven respondents agreed with the statement, "Coal bed methane should be developed in Montana with regulation to reduce negative affects on water and other land uses," and 23 selected the statement, "Coal bed methane will bring jobs and money to Montana and should be developed as soon as possible." (*Billings Gazette* 2001.) Thus, roughly one-third of the respondents supported CBNG development and two-thirds did not. A number of other written comments were published, which generally reflect the diversity of opinions described previously in the public comments section.

The results of a poll conducted by Montana State University at Billings were reported in the *Billings Gazette* on November 14, 2001. Of the respondents to this poll, 63 percent indicated support for CBNG in Montana if reasonable precautions were taken to protect the environment. Of the remainder of those polled, 11 percent indicated that CBNG should not be developed, 11 percent indicated it should be developed as quickly as possible, and 15 percent were undecided.

The Coalbed Natural Gas Alliance conducted a poll in the fall of 2004, and the results were reported in an article published by the *Billings Gazette* on January 19, 2005. The survey involved 450 landowners from a mailing list generated by six of the area's largest CBNG producers (Marathon, Devon, Huber, Fidelity, Yates Petroleum, and Nance). Of those responding to the survey, 36 percent said that the overall impact of CBNG development on their community has been "very positive," while 77 percent responded between "very positive" and "neutral." For a similar question regarding effects of CBNG development on the environment, 47 percent responded either "positive" or "neutral" and 32 percent responded "somewhat

negative." The article also presented comments on the survey from the director of the Powder River Basin Resource Council and a ranch owner. Their comments indicated that the survey results contradicted what they have experienced with ranchers and landowners.

Attitudes Toward Public Lands

Attitudes about general social conditions and about U.S. Bureau of Land Management's (BLM's) management of public lands in eastern Montana were gathered by Trent (1991) in interviews with about 100 residents. The results are summarized here from the discussion in the *Big Dry RMP/EIS* (BLM 1995). The residents indicated the most important aspects of their area and community were the outdoors and wide open spaces, good people, a small town atmosphere, keeping the community alive, the ability to earn a living, enjoying outdoor recreation, and, finally, that the area is a good place to raise children.

In relation to use and management of public lands, many of the respondents stated the importance of multiple uses and support for resource protection while allowing a variety of activities on public lands. Vegetation and soils were identified as the resources most important to protect, with livestock grazing and hunting the most favored activities. Recreation was slightly less favored and oil/gas, coal, and other mineral development were less favored than recreation. Concern about local economic conditions was predominant among the respondents. Respondents were concerned about the livestock industry, citing it as the most threatened activity on public lands. The respondents also were concerned with resource protection and preserving special resource values such as wildlife habitat, riparian areas, and wetlands.

Another summary of attitudes toward public lands and resource management is provided in the *Off-Highway Vehicle Final EIS* (U.S. Department of the Interior [USDI] 2001). The document states that social values for lands and natural resources take many forms, such as commodity, amenity, environmental quality, ecology, public use, spiritual, health, and security. In the past, natural resource management tended to emphasize commodity values. An emerging emphasis is a shift from commodities and services to environments and habitats. At the same time, in places where land use has been unrestricted, there is increasing concern by some that new regulations and uses are driving out traditional uses such as livestock grazing and off-highway vehicle use.

Oil and Gas Development

Other past data on attitudes toward oil and gas development is contained in the report "Natural Resource Development in Montana" (Wallwork and Johnson 1986). The discussion here is summarized from the *Final Oil and Gas RMP/EIS Amendment for Billings, Powder River and South Dakota* (1992). The original study consisted of interviews with 624 Montana adults. Nearly two-thirds of the respondents indicated natural resource development, in general, to be essential to the State's future economic health. The primary benefits were construed to be jobs and income, help the state and local economy, tax revenues, and the provision of needed products. Respondents indicated the primary costs or disadvantages associated with natural resource development would be environmental impacts, pollution, poor reclamation, population growth, and boom-and-bust economic cycles. About three-fifths of the respondents saw little or no conflict between natural resource development and outdoor recreation, while one-fourth felt that the two activities did conflict.

Most respondents in the 1986 interviews felt the following activities should be allowed on government lands: timber cutting (85 percent approval); oil and gas extraction (83 percent); coal mining (78 percent); and hardrock mining (79 percent). Some respondents felt the following activities should be prohibited on government lands: timber cutting (11 percent disapproval); oil and gas extraction (12 percent); coal mining (17 percent); and hard rock mining (15 percent). In response to specific questions about oil and gas leasing and development, about half the respondents felt oil and gas development to be essential to Montana's future economic health, with a higher percentage of respondents in eastern Montana feeling this way. Another third of the respondents indicated oil and gas development to be fairly essential. Responses to the pace of development were evenly split, with nearly 40 percent responding that it was just right and 40 percent feeling it was too slow. Nearly 75 percent of the respondents said they had a favorable impression of the industry. About two-fifths of the eastern Montana respondents rated the industry excellent or pretty good in its behavior as a responsible citizen of the state. Another two-fifths of these respondents rated the industry as only fair or poor in its behavior as a responsible state citizen.

Northern Cheyenne and Crow Tribes

Attitudes toward coal development among the members of the Northern Cheyenne and Crow tribes are described in the Economic, Social and Cultural Supplement to the *Powder River I Regional Draft EIS* (BLM 1989). While there may be differences in attitudes between coal development and natural gas (CBNG), there are also likely to be similarities.

Northern Cheyenne attitudes toward coal development are complex. In general, tribal members have shown a determination to maximize the potential benefits of coal development (such as training and employment opportunities and possible revenue sources) and to minimize the potential adverse effects (such as air quality degradation and increased demand on tribal facilities and services). In spite of the conflict it causes with traditional values and attitudes toward land and resources, many tribal members felt that if mining is going to occur in the area anyway, then the tribe and its members should try to reap some of its benefits as well as bear some of its costs. However, other Northern Cheyenne, particularly some of the more traditional elders, were firmly against energy development because of its disruption to the land and environment. They recognized that there is a need for jobs on the reservation but felt that other jobs that were less disruptive to the land and traditional values must be found.

The attitudes of individual Northern Cheyenne members toward coal development off the reservation reflected their perceptions about whether, and to what extent, they or their friends and family were benefiting from it. Those who were benefiting from coal-related employment or who aspired to do so seemed to be in favor of this development. Those who had been refused coal-related jobs or were not interested in them felt less positive about regional coal development. Many cited both positive effects (mostly jobs) and negative effects (environmental pollution, increased traffic, and drug and alcohol problems) that they believed were associated with the coal mines and power plants that had been constructed since 1970.

For residents of the Crow Reservation, a high level of concern was found regarding the impact that off-reservation coal development could have on the reservation. Three major concerns emerged regarding off-reservation coal development: 1) that it would compete with the marketing and development of on-reservation coal; 2) that reservation services and infrastructure would be affected and experience fiscal shortfalls; and 3) that regional coal development could have an impact on Crow culture and individual behavior such as alcohol and drug abuse. Specific cultural concerns included potential loss or dilution of culture values such as sharing and the importance of family as a result of the exposure to non-Native American values.

Many people on the Crow Reservation, including tribal officials, expressed the concern that federal coal would compete directly with tribal-owned coal. If federal coal is leased, then tribal-owned coal is less likely to be leased. Tribal coal leasing was seen by some members as a way for the tribe to raise money to save its land base and to enhance the tribe's ability to govern itself. If the tribe can generate its own revenues, it can determine how that money is spent and will no longer have to depend on the federal government to address problems.

See the section **Public Comments from SEIS Scoping Process (2005)** for a discussion regarding tribal concerns related to socioeconomic impacts from CBNG development.

Government Revenue Sources

Total county revenues for fiscal years 1999 and 2004 are presented in Table SEA-1. The table shows that the total revenues collected in the 13 Planning Area counties accounted for 21.0 percent of the revenues collected by all of the counties in the State in 1999 and 16.3 percent in 2004. By comparison, the Planning Area population was 21.8 percent of the state total in 2000.

Taxes

Total taxes collected by counties are shown in Table SEA-1. With some exceptions, taxes account for a large share—often about one half—of total county revenue. Counties that are less reliant on tax revenues have other miscellaneous income or intergovernmental income, generally related to natural resources rents or royalties.

Property Taxes and Assessed Value

Property taxes are levied by counties on real property and on any specified facilities and/or improvements to that real property.

The assessed value, taxable value, and total property taxes collected for the state and each study area county in 2000 are presented in Table SEA-2. The average mill levy rate for each county is also shown. Property taxes collected in the 13 study-area counties totaled more than $182 million, which is 23.0 percent of the state total. The percentage of property taxes collected in the study area is consistent with the study area population, which was similarly 21.8 percent of the state total in 2000. The taxes collected in the counties vary widely in accordance with the assessed values, taxable values, and tax rates and mill levies in each county.

Table SEA-4 shows the assessed value, taxable value, and total property taxes and fees collected in 2004 for each of the 13 counties in the study area. Total property taxes collected increased over 30 percent from 2000; however, the total of $239 million constituted 23.6 percent of the state total, which is similar to the proportion observed in 2000. Much of increase in property taxes came from Big Horn and Yellowstone counties, while smaller increases occurred for Carbon, Custer, Rosebud, Stillwater, and Sweet Grass counties. Total property taxes collected for the other counties in the study area were relatively unchanged between 2000 and 2004.

Natural Resource Taxes

Natural resource taxes were a relatively small component of total tax revenues, at $100 million or 6.5 percent. Natural resource taxes include taxes on coal, oil, natural gas, and metals mining. Table SEA-4 shows the State oil and natural gas tax revenues for 1999 and 2000. Total natural gas revenues were $11,205,901 in 2000—an increase of 8.1 percent from the previous year—while total oil revenues were $32,564,421—an increase of 59.1 percent from 1999. For both oil and natural gas, revenues in 2000 were 42.0 percent higher than 1999.

As shown in Table SEA-1, county revenues from oil and natural gas production taxes and the percent of these revenues compared to total county revenues varied greatly among the 13 study-area counties. For a number of the counties, the income was minimal or zero. The exceptions include Blaine County ($626,111 or 15.7 percent of county revenue), Carbon County ($178,443 or 4.1 percent) and Musselshell County ($256,627 or 7.1 percent). (Note: The Oil and Gas Production Tax [LGST] was eliminated after 1999.)

Oil and natural gas production tax revenues collected by the state of Montana from 1999 through 2004 are shown in Table SEA-5. While oil and natural gas revenues increased substantially in 2000 and 2001, 2002 revenues were markedly lower. In 2003 and 2004, the state share of these revenues has surpassed the 2002 total, while the local share remains below the 2002 high.

TABLE SEA-1

TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEARS 1999[1] AND 2004

	Revenue Source	Amount (1999)	% of County Total (1999)	Amount (2004)	% of County Total (2004)
Big Horn County	Taxes	$4,481,631	44.6%	$4,098,456	38.9%
	Licenses and Permits	$114,511	1.1%	$5,020	0.0%
	Intergovernmental	$1,235,480	12.3%	$3,226,513	30.7%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**	$5,280	0.1%		
	Charges for Services	$1,364,573	13.6%	$2,224,803	21.1%
	Fines and Forfeitures	$115,996	1.2%	$104,961	1.0%
	Miscellaneous Revenue	$2,090,577	20.8%	$779,100	7.4%
	Investment Earnings	$643,663	6.4%	$84,096	0.8%
	Total:	$10,046,431	100.0%	$10,522,949	100.0%
Carbon County	Taxes	$2,243,839	51.8%	$2,832,181	53.0%
	Licenses and Permits	$158,176	3.7%	$23,010	0.4%
	Intergovernmental	$1,441,197	33.3%	$2,020,479	37.8%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**	$178,443	4.1%		
	Charges for Services	$196,394	4.5%	$264,928	5.0%
	Fines and Forfeitures	$62,692	1.4%	$71,730	1.3%
	Miscellaneous Revenue	$62,203	1.4%	$68,384	1.3%
	Investment Earnings	$164,215	3.8%	$64,181	1.2%
	Total:	$4,328,716	100.0%	$5,344,893	100.0%
Carter County	Taxes	$1,026,167	53.9%	$1,503,686	61.9%
	Licenses and Permits	$20,765	1.1%	$80	0.0%
	Intergovernmental	$267,473	14.1%	$614,190	25.3%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**				
	Charges for Services	$100,220	5.3%	$191,450	7.9%
	Fines and Forfeitures	$6,569	0.3%	$6,238	0.3%
	Miscellaneous Revenue	$399,562	21.0%	$85,202	3.5%
	Investment Earnings	$82,130	4.3%	$29,395	1.2%
	Total:	$1,902,886	100.0%	$2,430,241	100.0%

TABLE SEA-1

TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEARS 1999[1] AND 2004

	Revenue Source	Amount (1999)	% of County Total (1999)	Amount (2004)	% of County Total (2004)
Custer County	Taxes	$2,327,867	49.8%	$2,865,221	52.7%
	Licenses and Permits	$110,737	2.4%	$1,930	0.0%
	Intergovernmental	$1,042,529	22.3%	$1,519,309	28.0%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**	$41,434	0.9%		
	Charges for Services	$484,733	10.4%	$634,756	11.7%
	Fines and Forfeitures	$68,931	1.5%	$71,477	1.3%
	Miscellaneous Revenue	$471,159	10.1%	$257,342	4.7%
	Investment Earnings	$163,813	3.5%	$84,131	1.5%
	Total:	$4,669,769	100.0%	$5,434,166	100.0%
Golden Valley County	Taxes	$387,137	57.0%	$426,703	52.0%
	Licenses and Permits	$13,242	1.9%	$480	0.1%
	Intergovernmental	$174,519	25.7%	$286,189	34.9%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**	$6,415	0.9%		
	Charges for Services	$22,560	3.3%	$29,886	3.6%
	Fines and Forfeitures	$13,219	1.9%	$10,484	1.3%
	Miscellaneous Revenue	$4,967	0.7%	$3,903	0.5%
	Investment Earnings	$63,575	9.4%	$62,381	7.6%
	Total:	$679,219	100.0%	$820,026	100.0%
Musselshell County	Taxes	$1,084,288	30.1%	$1,305,277	37.0%
	Licenses and Permits	$73,915	2.0%	$1,835	0.1%
	Intergovernmental	$739,530	20.5%	$1,616,815	45.9%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**	$256,627	7.1%		
	Charges for Services	$256,627	7.1%	$354,328	10.1%
	Fines and Forfeitures	$35,272	1.0%	$77,828	2.2%
	Miscellaneous Revenue	$1,287,222	35.7%	$89,835	2.5%
	Investment Earnings	$130,944	3.6%	$79,074	2.2%
	Total:	$3,607,798	100.0%	$3,524,992	100.0%

TABLE SEA-1

TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEARS 1999[1] AND 2004

	Revenue Source	Amount (1999)	% of County Total (1999)	Amount (2004)	% of County Total (2004)
Powder River County	Taxes	$1,193,285	37.7%	$1,732,413	37.8%
	Licenses and Permits	$44,235	1.4%	$905	0.0%
	Intergovernmental	$586,548	18.5%	$1,174,272	25.6%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**	$89,261	2.8%		
	Charges for Services	$1,177,971	37.2%	$1,555,757	33.9%
	Fines and Forfeitures	$29,218	0.9%	$42,180	0.9%
	Miscellaneous Revenue	$50,028	1.6%	$52,971	1.2%
	Investment Earnings	$86,243	2.7%	$29,086	0.6%
	Total:	$3,167,528	100.0%	$4,587,584	100.0%
Rosebud County	Taxes	$3,736,882	50.7%	$2,417,614	32.2%
	Licenses and Permits	$96,804	1.3%	$1,450	0.0%
	Intergovernmental	$1,627,917	22.1%	$3,574,494	47.6%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**	$14,024	0.2%		
	Charges for Services	$642,491	8.7%	$1,132,386	15.1%
	Fines and Forfeitures	$86,111	1.2%	$61,590	0.8%
	Miscellaneous Revenue	$824,751	11.2%	$80,518	1.1%
	Investment Earnings	$349,646	4.7%	$249,154	3.3%
	Total:	$7,364,602	100.0%	$7,517,206	100.0%
Stillwater County	Taxes	$2,302,415	8.3%	$2,365,085	51.5%
	Licenses and Permits	$338,758	1.2%	$17,420	0.4%
	Intergovernmental	$24,113,855	86.8%	$1,177,398	25.7%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**	$11,326	0.0%		
	Charges for Services	$256,559	0.9%	$717,346	15.6%
	Fines and Forfeitures	$101,596	0.4%	$115,777	2.5%
	Miscellaneous Revenue	$445,202	1.6%	$163,371	3.6%
	Investment Earnings	$215,360	0.8%	$33,644	0.7%
	Total:	$27,773,745	100.0%	$4,590,041	100.0%

TABLE SEA-1

TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEARS 1999[1] AND 2004

	Revenue Source	Amount (1999)	% of County Total (1999)	Amount (2004)	% of County Total (2004)
Sweet Grass County	Taxes	No Report Received		$2,082,286	22.1%
	Licenses and Permits			$345	0.0%
	Intergovernmental			$2,366,927	25.1%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**				
	Charges for Services			$4,247,320	45.0%
	Fines and Forfeitures			$56,549	0.6%
	Miscellaneous Revenue			$640,310	6.8%
	Investment Earnings			$41,322	0.4%
	Total:			$9,435,059	100.0%
Treasure County	Taxes	$422,269	60.4%	$474,025	52.8%
	Licenses and Permits	$16,076	2.3%		
	Intergovernmental	$124,734	17.8%	$259,193	28.9%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**				
	Charges for Services	$46,933	6.7%	$87,309	9.7%
	Fines and Forfeitures	$47,409	6.8%	$19,906	2.2%
	Miscellaneous Revenue	$16,561	2.4%	$48,112	5.4%
	Investment Earnings	$25,710	3.7%	$8,568	1.0%
	Total:	$699,692	100.0%	$897,113	100.0%
Wheatland County	Taxes	$20,477	0.84%	$1,141,255	59.7%
	Licenses and Permits	$240,304	9.9%		
	Intergovernmental	$132,438	5.4%	$520,918	27.2%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**				
	Charges for Services	$25,717	1.06%	$182,543	9.5%
	Fines and Forfeitures	$416,588	17.2%	$18,068	0.9%
	Miscellaneous Revenue	$22,246	0.92%	$10,066	0.5%
	Investment Earnings	$1,557,462	64.5%	$38,797	2.0%
	Total:	$2,415,232	100.0%	$1,911,647	100.0%

TABLE SEA-1

TOTAL COUNTY REVENUES BY SOURCE, FISCAL YEARS 1999[1] AND 2004

	Revenue Source	Amount (1999)	% of County Total (1999)	Amount (2004)	% of County Total (2004)
Yellowstone County	Taxes	$16,996,908	44.1%	$20,549,931	49.2%
	Licenses and Permits	$2,732,460	7.1%	$3,482,605	8.3%
	Intergovernmental	$7,946,773	20.6%	$6,345,544	15.2%
	Oil and Gas Production Tax (LGST) **(Included in Intergovernmental above)**	$5,155	0.0%		
	Charges for Services	$8,757,415	22.7%	$10,103,632	24.2%
	Fines and Forfeitures	$676,103	1.8%	$737,145	1.8%
	Miscellaneous Revenue	$240,406	0.6%	$251,641	0.6%
	Investment Earnings	$1,232,920	3.2%	$260,324	0.6%
	Total:	$38,582,985	100.0%	$41,730,822	100.0%
Study Area Total[2]		**119,820,279**		**$98,746,739**	
% of State Total		**21.0%**		**16.3%**	
Montana State Total		**569,806,112**		**604,483,926**	

Source: Montana Department of Commerce, Billings (2000, 2006).
[1]Based on unaudited data reported by Counties.
[2]1999 total does not include Sweet Grass County (no data available).

TABLE SEA-2

ASSESSED VALUES AND PROPERTY TAX COLLECTIONS BY COUNTY (2000)

	2000 Assessed Value	2000 Taxable Value	Total Property Taxes and fees Collected	Average Mill Levy
Big Horn County	$565,023,700	$21,354,436	$6,952,144	293.77
Carbon County	$521,678,159	$23,754,742	$9,288,300	349.51
Carter County	$120,132,817	$6,808,649	$2,382,143	329.01
Custer County	$371,459,345	$14,389,152	$8,806,856	460.53
Golden Valley County	$98,470,244	$5,687,402	$1,784,283	305.79
Musselshell County	$179,355,501	$6,881,914	$3,173,428	393.23
Powder River County	$125,672,599	$4,415,991	$2,227,445	463.94
Rosebud County	$1,957,565,773	$100,635,100	$20,804,541	173.34
Stillwater County	$697,014,674	$28,705,444	$10,708,053	319.89
Sweet Grass County	$247,083,525	$9,532,599	$3,677,085	354.74
Treasure County	$86,217,475	$4,306,117	$1,646,795	329.73
Wheatland County	$162,260,802	$10,468,500	$3,263,418	297.22
Yellowstone County	$5,245,460,701	$204,127,734	$107,952,414	378.48
Study Area Total	**$10,377,395,315**	**$441,067,780**	**$182,666,905**	--
% of State Total	**no data**	**26.3%**	**23.0%**	--
Montana	**no data**	**$1,679,739,857**	**$794,598,177**	--

Source: Montana Department of Revenue (2000).

TABLE SEA-3

ASSESSED VALUES AND PROPERTY TAX COLLECTIONS BY COUNTY (2004)

	2004 Assessed Value	2004 Taxable Value	Total Property Taxes and fees Collected
Big Horn County	$509,234,496	$19,071,825	$13,500,559
Carbon County	$604,545,613	$24,558,032	$12,059,295
Carter County	$128,295,092	$10,269,939	$3,692,825
Custer County	$395,219,177	$14,165,809	$11,267,038
Golden Valley County	$94,613,026	$4,919,186	$1,905,042
Musselshell County	$200,581,108	$6,560,315	$3,949,930
Powder River County	$119,338,454	$4,005,441	$2,554,997
Rosebud County	$1,676,984,323	$84,867,600	$22,071,869
Stillwater County	$767,840,416	$28,823,824	$12,852,966
Sweet Grass County	$447,045,426	$14,688,014	$6,087,181
Treasure County	$82,736,041	$3,932,398	$1,780,852
Wheatland County	$152,027,561	$9,001,462	$3,497,120
Yellowstone County	$6,077,895,654	$215,714,493	$143,708,149
Study Area Total	**$11,256,356,387**	**$440,578,338**	**$238,927,823**
% of State Total	**22.8%**	**24.8%**	**23.6%**
Montana	**$49,450,862,550**	**$1,779,929,986**	**$1,014,487,652**

Source: Montana Department of Revenue (2004).

TABLE SEA-4

MONTANA OIL AND NATURAL GAS PRODUCTION TAX REVENUES (1999 AND 2000)

	1999	2000	% Change 1999-2000
Natural Gas Tax Revenues	$10,367,718	$11,205,901	8.1%
% of Total	33.6%	25.6%	
Oil Tax Revenues	$20,461,684	$32,564,421	59.1%
% of Total	66.4%	74.4%	
Total	**$30,829,402**	**$43,770,322**	**42.0%**

Source: Montana Department of Revenue (2000).

TABLE SEA-5

MONTANA OIL AND NATURAL GAS PRODUCTION TAX REVENUES (1999 THROUGH 2004)

	1999	2000	2001	2002	2003	2004
Total State Share	$9,221,612	$13,817,290	$31,392,351	$15,837,967	$30,894,533	$47,712,085
% Change from Previous Year		49.8%	127.2%	-49.5%	95.1%	54.4%
Total Local Share	$21,607,789	$29,953,032	$61,425,763	$34,465,644	$42,494,843	$44,963,964
% Change from Previous Year		38.6%	105.1%	-43.9%	23.3%	5.8%
Total	**$30,829,401**	**$43,770,322**	**$92,818,114**	**$50,303,611**	**$73,389,376**	**$92,676,049**
% Increase from Previous Year		42.0%	112.1%	-45.8%	45.9%	26.3%

Source: Montana Department of Revenue (2004).

SOILS APPENDIX

SOILS APPENDIX

The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Services (NRCS) has published a general soil association map for Montana in digital format. The State Soil Geographic Database (STATSGO) (USDA NRCS 1996) provides a general overview of soils distribution and occurrences in the planning area, at a 1:250,000 scale and is not suitable for site-specific evaluations. More detailed information is available from Soil Survey Geographic Databases (SSURGO) at http://www.ncgc.nrcs.usda.gov/products/datasets/ssurgo/index.html. General soils information presented in the State Soil Geographic Database (STATSGO) is presented in the *Soils Technical Report* (ALL 2001a). Information presented includes the areal extent, soil series characteristics, K-factor (erosion potential), salinity, and sodium adsorption ratio (SAR) for the various soil groups in the Powder River RMP and Billings RMP areas. The *Soils Technical Report* was prepared to present the potential impacts from the coal bed natural gas (CBNG) extraction process on land and the environment, with a focus on impacts to agriculture, and including potential effects on crops, livestock, and soils. The report was used to prepare this section and provides more detailed information pertaining to soils and CBNG development impacts to the environment. The complete Soils Technical Report can be accessed at http://www.mt.blm.gov/mcfo.

The layout of the soils in the study area is shown in Figures SOI-1 and SOI-2 for the Billings Resource Management Plan (RMP) Area and Powder River RMP area, respectively. A total of 163 soil mapping units composed of 205 soil series are present in the two RMP areas. The seven principal soil mapping units based on areal extent within the two RMP areas are:

- MT421 Cambeth-Megonot-Manning (4.3 percent)
- MT089 Yamac-Birney-Cabbart (4.3 percent)
- MT676 Yawdim-Delpoint-Thurlow (4.0 percent)
- MT675 Cabbart-Yawdim-Thurlow (3.9 percent)
- MT384 Marvan-Neldore-Bascovy (3.5 percent)
- MT103 Cabbart-Delpoint-Yamac (3.0 percent)
- MT559 Tanna-Rentsac-Yawdim (2.9 percent)

These seven soil mapping units compose 26 percent of the two RMP areas, with the remaining 156 soil mapping units making up the remainder. Table SOI-1 presents all of the soil mapping units in the Billings RMP and Powder River RMP areas, along with the percent of the total RMP areas occupied by each mapping unit. Table SOI-2 presents some of the key soil characteristics related to erosion and salinity for the topmost 25 mapping units based on percent of total area.

Soils in the RMP areas are derived mainly from sedimentary bedrock and alluvium. The soils generally range from loams to clays, but are principally loams to silty clay loams.

Slope and K-factor are values that are used in the estimation of soil erosion potential. Slope values range up to greater than 40 percent; however, there are many soils that have slopes of zero to about 10 percent. Almost all of the soils have low K-factors (below 0.37). Easily eroded soils have a K-factor between 0.37 and 0.69, and resistant soils have a K-factor less than 0.37 (Jarrett 1995). Figures presenting the mean K-factor of the soils in the Billings RMP and Powder River RMP areas are included in the *Soils Technical Report* (ALL 2001). Figures SOI-1 and SOI-2 are included here to summarize the information.

Soil salinity affects the suitability of a soil for crop production and the stability of the soil. The SAR is the measure of sodium relative to calcium and magnesium, and affects the soil structure and infiltration rate of water. The *Soils Technical Report* presents a more detailed discussion pertaining to the salinity and SAR of the soils in the Billings RMP and Powder River RMP areas. As shown in Table SOI-2, most of the soils are very low in salinity. The SAR values in the study areas and statewide vary widely and, with few exceptions, are low in sodium. Based on the generally fine texture of the surface soils (clayey), much of the soil will likely be susceptible to increasing sodicity when irrigated with water having a high SAR. Permeability is the measure of vertical water movement when the soil is saturated. The soil structure, porosity, gradation and texture all influence the permeability of the soil. Those soils with a coarser texture (sandy to loamy) and good internal drainage (higher permeability) will be the least susceptible to increasing sodicity and salinity. Much of the soil is likely to be irrigable with good management.

TABLE SOIL-1
AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

STATSGO Map Unit	Map Unit Name	Acres	Percent of Area
MT001	Abac-Peritsa-Rock Outcrop	93,754	0.48
MT003	Absarokee-Castner-Sinnigam	436,268	2.25
MT004	Absarokee-Wayden-Redcreek Family	23,322	0.12
MT006	Absarokee-Castner-Grail	15,901	0.08
MT007	Absarokee-Hilger-Big Timber	70,560	0.36
MT016	Winler-Lismas-Swanboy	21,332	0.11
MT017	Archin-Twilight-Bonfri	78,323	0.4
MT019	Assinniboine-Pring-Archin	459,121	2.37
MT024	Badland-Bullock-Neldore	129,347	0.67
MT027	Bainville-Mcrae-Rock Outcrop	453,939	2.35
MT028	Bainville-Rock Outcrop-Travessilla	205,254	1.06
MT029	Bainville-Travessilla Family-Evanston	171,636	0.89
MT037	Beauvais-Hydro-Lambeth	83,773	0.43
MT041	Bew-Toluca-Nobe	8,032	0.04
MT042	Big Timber-Cabba-Absarokee	107,565	0.56
MT048	Bitton-Shambo-Doney	428,667	2.22
MT051	Blackhall-Twilight-Zeona	21,144	0.11
MT054	Cabbart-Bonfri-Cambeth	2	<0.01
MT055	Bonfri-Gerdrum-Galbreth	3,927	0.02
MT070	Bryant-Doney-Shambo	56,522	0.29
MT075	Yamac-Busby-Cabbart	104,872	0.54
MT076	Cabba-Travessilla Family-Birney	121,597	0.63
MT078	Cabba-Campspass-Farland	6,969	0.04
MT080	Cabba-Farland-Yawdim	38,170	0.2
MT083	Cabba-Ringling-Yawdim	300,378	1.55
MT084	Cabba-Ringling-Yawdim	493,159	2.55
MT089	Yamac-Birney-Cabbart	827,152	4.27
MT090	Cabbart-Cambeth-Bonfri	183,942	0.95
MT092	Delpoint-Cabbart-Yamac	552,861	2.86

TABLE SOIL-1
AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

STATSGO Map Unit	Map Unit Name	Acres	Percent of Area
MT095	Cabbart-Keiser-Dast	57,076	0.29
MT096	Cabbart-Pultney Family-Stormitt	43,281	0.22
MT097	Cabbart-Rentsac-Delpoint	283,471	1.46
MT099	Cabbart-Rock Outcrop-Twilight	116,567	0.6
MT100	Cabbart-Twilight-Forelle	31,738	0.16
MT103	Cabbart-Delpoint-Yamac	577,016	2.98
MT112	Castner-Savage-Chama	5,667	0.03
MT113	Castner-Chama-Regent	4,089	0.02
MT114	Castner-Darret-Windham	3	<0.01
MT120	Wayden-Castner-Cabba	47,803	0.25
MT127	Chinook-Archin-Delpoint	6	<0.01
MT145	Crago-Musselshell-Attewan	545,006	2.82
MT146	Crago-Musselshell-Fairfield	7,046	0.04
MT148	Creed-Gerdrum-Forelle	1,072	0.01
MT152	Cushman-Yawdim-Bainville	54,706	0.28
MT153	Danvers-Tinsley-Oburn	72,675	0.38
MT155	Danvers-Judith-Windham	49,063	0.25
MT157	Dast-Forelle-Delpoint	31,137	0.16
MT159	Dast-Mcrae-Travessilla Family	84,373	0.44
MT161	Degrand-Kremlin-Ethridge	10,319	0.05
MT164	Cabbart-Delpoint-Yamac	278,907	1.44
MT165	Delpoint Family-Kirby-Delpoint	33,440	0.17
MT167	Delpoint-Travessilla Family-Cabbart	216,026	1.12
MT168	Delpoint-Cabbart-Yamac	105,771	0.55
MT173	Dolus-Boxwell-Castner	22,680	0.12
MT174	Doney-Reeder-Cabba	72,377	0.37
MT175	Doney-Shaak-Wayden	232,912	1.2
MT176	Doney-Winifred-Wayden	73,711	0.38
MT182	Starley-Rock Outcrop-Babb	147,700	0.76

TABLE SOIL-1
AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

STATSGO Map Unit	Map Unit Name	Acres	Percent of Area
MT187	Ethridge-Kremlin-Marias	9,089	0.05
MT190	Evanston-Lonna-Tinsley	19,800	0.1
MT193	Fairway Family-Tetonview-Villy	8,546	0.04
MT209	Forkwood-Vonalee-Haverdad	31,675	0.16
MT213	Garlet-Cowood-Rock Outcrop	298	<0.01
MT216	Garlet-Rubble Land-Cowood	2,132	0.01
MT217	Garlet-Sebud-Cheadle	22,544	0.12
MT218	Shadow-Garlet-Macfarlane	257,150	1.33
MT224	Gerdrum-Forelle-Archin	38,201	0.2
MT225	Harlem-Gerdrum-Ethridge	26,205	0.14
MT228	Gilt Edge-Absher-Yawdim	11,675	0.06
MT247	Harlem-Vanda-Marvan	10,450	0.05
MT249	Stormitt-Harvey Family-Nihill	48,815	0.25
MT252	Haverson-Heldt-Toluca	16,832	0.09
MT254	Havre-Glendive-Water	30,577	0.16
MT255	Havre-Harlem-Attewan	25,454	0.13
MT256	Havre-Harlem-Glendive	88,473	0.46
MT258	Havre-Ryell-Harlem	50,431	0.26
MT259	Havre-Hanly-Glendive	173,933	0.9
MT261	Havre-Rivra-Water	114,549	0.59
MT263	Havre-Kobar-Spinekop	47,424	0.25
MT264	Havre-Glendive-Yamac	10,938	0.06
MT269	Heath-Charlos-Maurice	58,449	0.3
MT271	Heldt-Fort Collins-Kobar	43,967	0.23
MT273	Helmville-Whitore-Tropal	126,307	0.65
MT301	Keiser-Hydro-Gilt Edge	112,102	0.58
MT309	Kobar-Yamac-Attewan	23,490	0.12
MT321	Lamedeer-Ringling-Twin Creek	35,383	0.18
MT323	Lap-Windham-Armington	104,714	0.54

TABLE SOIL-1
AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

STATSGO Map Unit	Map Unit Name	Acres	Percent of Area
MT324	Lardell-Mckenzie-Kobar	28,542	0.15
MT327	Libeg-Leavitt-Hanson	17,866	0.09
MT336	Lihen-Delpoint-Tinsley	5,762	0.03
MT338	Lisam-Abor-Vanda	303,030	1.57
MT339	Lisam-Abor-Hesper	28,331	0.15
MT349	Lolo-Work-Shawa	39,683	0.21
MT365	Maginnis-Absarokee-Rock Outcrop	116,071	0.6
MT369	Marias-Havre-Harlem	143,781	0.74
MT374	Martinsdale-Fairfield-Reeder	7	<0.01
MT379	Marvan-Abor-Neldore	97,192	0.5
MT382	Marvan-Gerdrum-Vanda	200,503	1.04
MT383	Harlem-Vanda-Marvan	23,594	0.12
MT384	Marvan-Neldore-Bascovy	677,263	3.5
MT393	Mcrae-Harlem-Keiser	103,536	0.54
MT396	Midway-Shingle-Rock Outcrop	76,447	0.4
MT400	Mirror-Bross-Vasquez	56,548	0.29
MT407	Moyerson-Rock Outcrop-Orinoco	253,541	1.31
MT414	Neldore-Abor-Vanda	7,787	0.04
MT415	Neldore-Abor-Volborg	93,856	0.49
MT421	Cambeth-Megonot-Manning	829,387	4.29
MT433	Nunn-Toluca-Heldt	5,480	0.03
MT438	Bridger-Bynum-Owen Creek	16,109	0.08
MT456	Pinelli-Glendive-Busby	4,780	0.02
MT459	Prospect-Sublette-Teton	9,292	0.05
MT466	Reeder Family-Barvon-Mowbray	136,554	0.71
MT471	Rentsac-Cabbart-Blackhall	24,662	0.13
MT472	Yawdim-Rentsac-Lambeth	149,344	0.77
MT474	Broadus-Ridge-Cabba	42,375	0.22
MT475	Ringling-Cabba-Relan	16,537	0.09

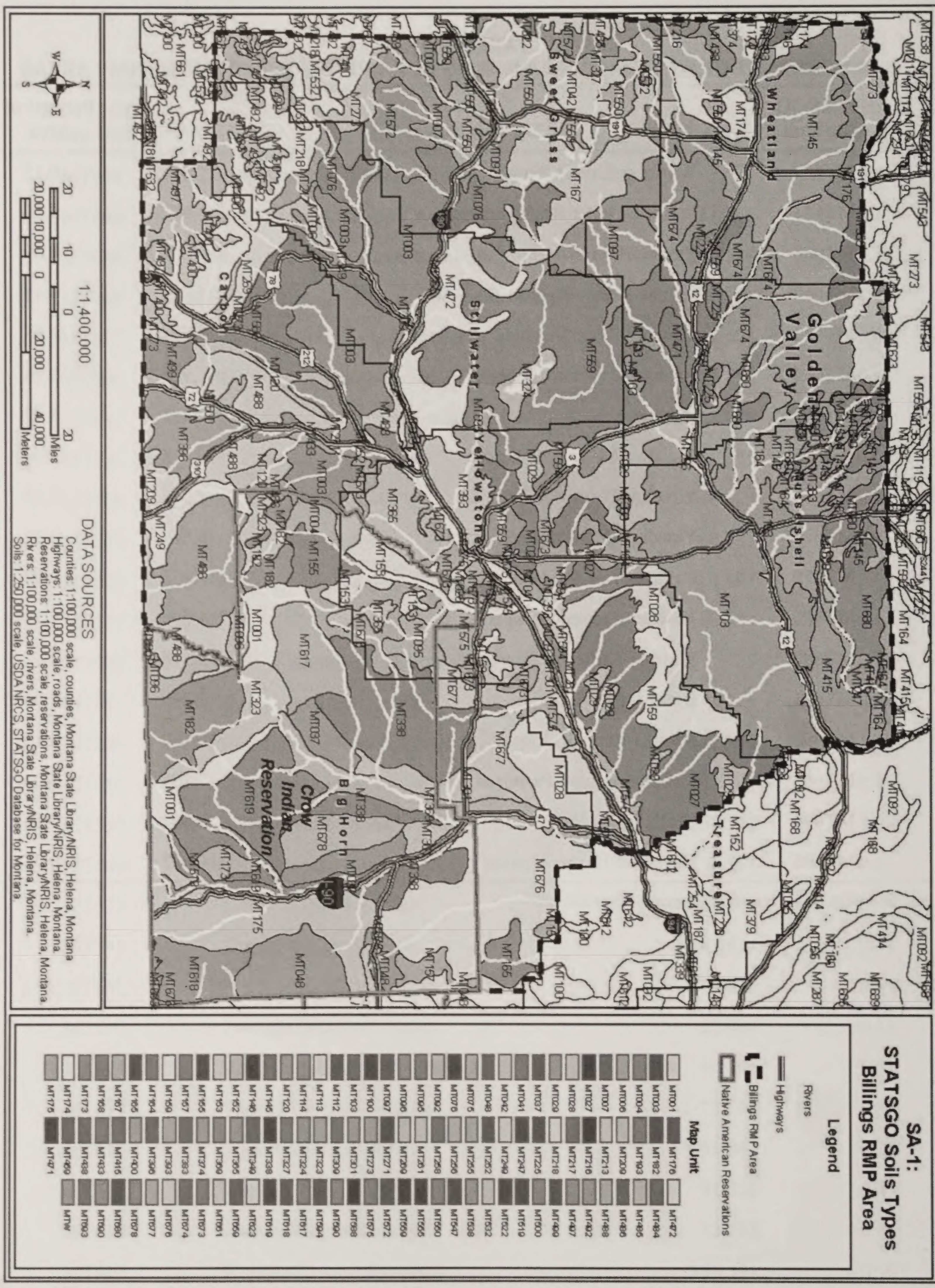
TABLE SOIL-1
AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

STATSGO Map Unit	Map Unit Name	Acres	Percent of Area
MT484	Rock Outcrop-Dryadine-Rubble Land	3,611	0.02
MT485	Garlet-Rock Outcrop-Cryoborolls	21,066	0.11
MT486	Rock Outcrop-Hanson-Whitecow	159,584	0.82
MT488	Rock Outcrop-Midway-Travessilla Family	236,799	1.22
MT489	Abor-Rock Outcrop-Delpoint	17,571	0.09
MT492	Rock Outcrop-Rubble Land-Cowood	127,770	0.66
MT497	Rock Outcrop-Water-Rubble Land	68,075	0.35
MT499	Romberg-Calicott-Hiland	28,655	0.15
MT500	Romberg-Naturita-Heldt	40,683	0.21
MT519	Savage-Forelle-Frazer	68,982	0.36
MT522	Savage-Work-Chama	4,497	0.02
MT532	Shadow-Garlet-Water	48,413	0.25
MT538	Skaggs-Starley-Raynesford	25	<0.01
MT547	Garlet-Stemple-Tigeron	1,244	0.01
MT550	Sweetgrass-Hilger-Fairfield	227,202	1.17
MT555	Tamaneen-Judith-Windham	53,564	0.28
MT559	Tanna-Rentsac-Yawdim	567,531	2.93
MT569	Yawdim-Thurlow-Cabbart	116,568	0.6
MT572	Tigeron-Garlet-Worock	142,349	0.74
MT575	Tinsley-Keiser-Yawdim	141,874	0.73
MT588	Work-Turner-Wayden	149,865	0.77
MT590	Twilight-Blackhall-Busby	22,004	0.11
MT594	Vananda-Gerdrum-Mckenzie	60,705	0.31
MT597	Vanstel-Cabbart-Delpoint	72,598	0.38
MT612	Wanetta-Hesper-Bitton	30,042	0.16
MT617	Wayden-Abac-Rock Outcrop	91,333	0.47
MT618	Wayden-Regent-Doney	82,113	0.42
MT619	Wayden-Eltsac-Maschetah	186,591	0.96
MT623	Whitecow-Mocmont-Hughesville	41,880	0.22

TABLE SOIL-1
AREAL EXTENT OF SOIL MAP UNITS FOR POWDER RIVER AND BILLINGS RMP AREAS

STATSGO Map Unit	Map Unit Name	Acres	Percent of Area
MT659	Wormser-Lavina-Yawdim	29,616	0.15
MT661	Worock-Garlet-Rock Outcrop	3,050	0.02
MT668	Yamac-Havre-Birney	211,006	1.09
MT669	Yamac-Kobar-Marvan	22,214	0.11
MT673	Yawdim-Abor-Vananda	179,618	0.93
MT674	Cabbart-Yawdim-Delpoint	147,969	0.76
MT675	Cabbart-Yawdim-Thurlow	758,425	3.92
MT676	Yawdim-Delpoint-Thurlow	770,758	3.98
MT677	Yawdim-Delpoint-Gerdrum	82,348	0.43
MT678	Yawdim-Ethridge-Rock Outcrop	70,647	0.37
MT679	Cabbart-Yawdim-Hesper	189,351	0.98
MT680	Yawdim-Orinoco-Amherst	214,696	1.11
MT690	Welring-Clifterson-Shavano	2,718	0.01
MT691	Ulm-Maggin-Louviers	7,403	0.04
MT692	Shingle-Renohill-Ulm	36,589	0.19
MT693	Samday-Shingle-Parmleed	7,705	0.04
MT694	Orella-Epsie-Winler	26,102	0.13
MT695	Haverdad-Havre-Zigweid	14,472	0.07

Source: USDA NRSC State Soil Geographic Database 1996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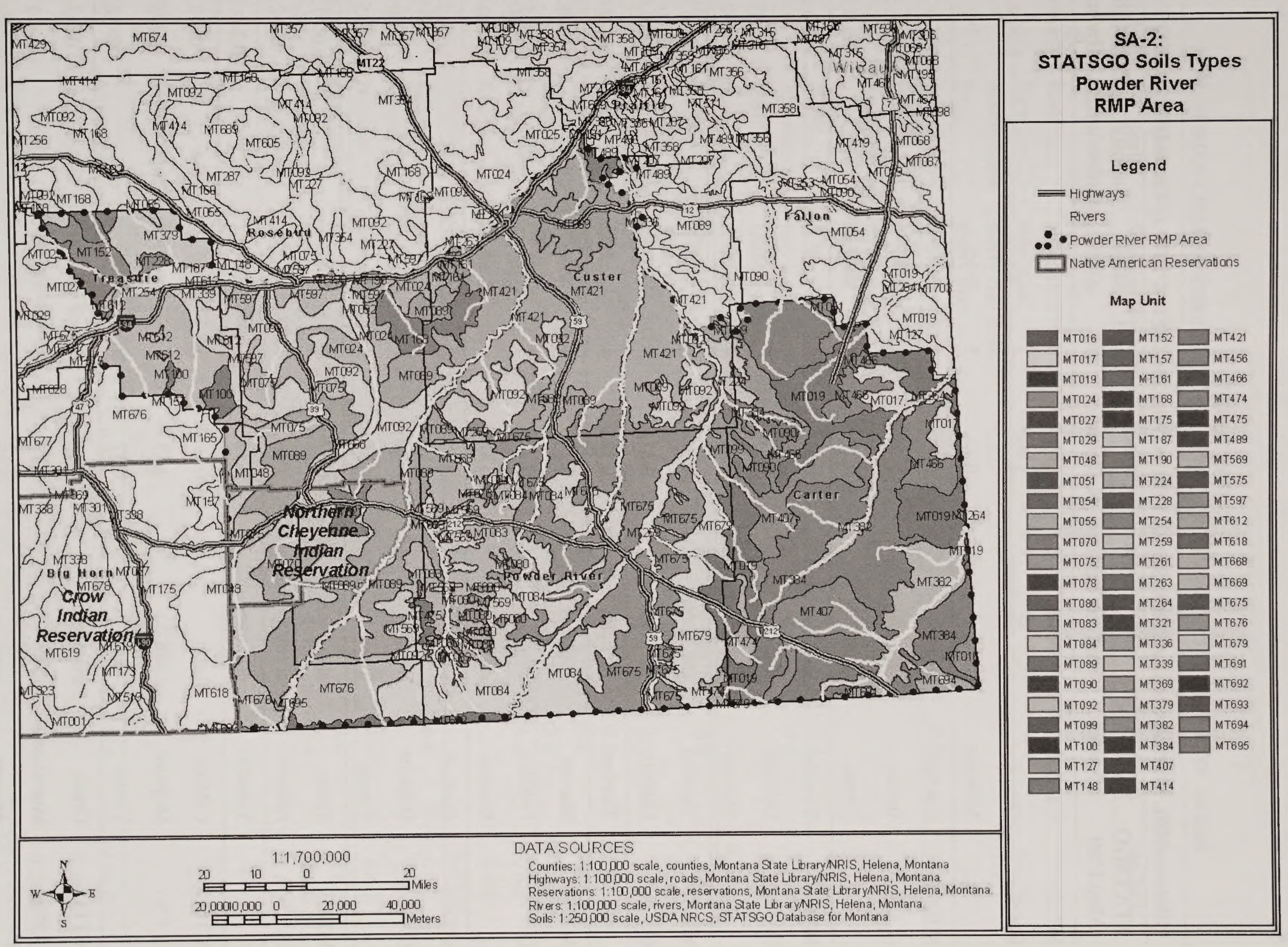
STATSGO Soils Types
Billings RMP Area
Legend
Rivers
Highways
Billings RMP Area
Native American Reservations
Map Unit
1:1,400,000
Miles
Meters
DATA SOURCES
Counties: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana
Highways: 1:100,000 scale, roads, Montana State Library/NRIS, Helena, Montana
Reservations: 1:100,000 scale, reservations, Montana State Library/NRIS, Helena, Montana
Rivers: 1:100,000 scale, rivers, Montana State Library/NRIS, Helena, Montana.
Soils: 1:250,000 scale, USDA NRCS, STATSGO Database for Montana.
Wheatland
Golden Valley
Musselshell
Sweet Grass
Stillwater
Yellowstone
Carbon
Big Horn
Treasure
Crow Indian Reservation


SA-2:
STATSGO Soils Types
Powder River
RMP Area
Legend
Highways
Rivers
Powder River RMP Area
Native American Reservations
Map Unit
MT016
MT017
MT019
MT024
MT027
MT029
MT048
MT051
MT054
MT055
MT070
MT075
MT078
MT080
MT083
MT084
MT089
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MT692
MT693
MT694
MT695
Fallon
Custer
Carter
Powder River
Rosebud
Treasure
Big Horn
Northern Cheyenne Indian Reservation
Crow Indian Reservation
1:1,700,000
20 10 0 20 Miles
20,000 10,000 0 20,000 40,000 Meters
DATA SOURCES
Counties: 1:100,000 scale, counties, Montana State Library/NRIS, Helena, Montana
Highways: 1:100,000 scale, roads, Montana State Library/NRIS, Helena, Montana.
Reservations: 1:100,000 scale, reservations, Montana State Library/NRIS, Helena, Montana.
Rivers: 1:100,000 scale, rivers, Montana State Library/NRIS, Helena, Montana
Soils: 1:250,000 scale, USDA NRCS, STATSGO Database for Montana

TABLE SOIL-2
SOIL SERIES CHARACTERISTICS FOR POWDER RIVER & BILLINGS RMP AREAS

STATSGO Map Unit	Major Soil Series	Surface Texture	K-factor[1]	Depth (in)	Slope (%)	Salinity[2] (mmhos/cm)	Permeability (in/hr)
MT421	Cambeth	silt loam	0.37	6	4-25		0.6-0.2
(4.3 %)	Megonot	silty clay loam	0.37	5	4-15		0.06-0.2
	Manning	loam	0.32	5	8-15		2-6
MT089	Cabbart	loam	0.37	3	15-70	0-4	0.6-0.2
(4.3 %)	Birney	channery loam	0.2	5	25-70	0-2	0.6-0.2
	Yamac	loam	0.37	5	15-25		0.6-0.2
MT676	Yawdim	silty clay loam	0.37	3	8-35		0.2-0.6
(4.0 %)	Delpoint	loam	0.37	3	8-35	0-4	0.6-2
	Thurlow	silty clay loam	0.32	4	0-8		0.6-2
MT675	Yawdim	clay loam	0.37	3	8-70		0.2-0.6
(3.9 %)	Cabbart	silt loam	0.37	3	15-75	0-4	0.2-0.6
	Thurlow	silty clay loam	0.32	4	2-15		0.2-0.6
MT384	Marvan	silty clay	0.37	4	0-8	0-4	0.06-0.2
(3.5 %)	Neldore	clay	0.32	3	4-15	0-2	0.06-0.2
	Bascovy	clay	0.37	6	2-15	2-4	0.06-0.2
MT103	Cabbart	loam	0.37	3	6-45	0-4	0.6-2
(3.0 %)	Delpoint	loam	0.37	3	15-35	0-4	0.6-2
	Yamac	loam	0.37	5	2-8		0.6-2
MT559	Tanna	clay loam	0.37	6	2-8		0.06-0.2
(2.9 %)	Rentsac	channery loam	0.2	7	4-15		0.6-2
	Yawdim	clay loam	0.37	3	25-60		0.2-0.6
MT092	Cabbart	loam	0.37	3	8-70	0-4	0.6-2
(2.9 %)	Delpoint	loam	0.37	3	15-25	0-4	0.6-2
	Yamac	loam	0.37	5	2-8		0.6-2
MT145	Crago	loam	0.37	4	0-4		0.6-2
(2.8%)	Musselshell	loam	0.37	3	0-2		0.6-2
	Attewan	loam	0.37	6	0-2		0.6-2

TABLE SOIL-2
SOIL SERIES CHARACTERISTICS FOR POWDER RIVER & BILLINGS RMP AREAS

STATSGO Map Unit	Major Soil Series	Surface Texture	K-factor[1]	Depth (in)	Slope (%)	Salinity[2] (mmhos/cm)	Permeability (in/hr)
MT084	Cabba	silt loam	0.37	3	15-50	0-4	0.6-2
(2.6 %)	Ringling	channery-loam	0.17	5	5-50		0.6-2
	Yawdim	clay loam	0.37	3	8-70		0.2-0.6
MT019	Assinniboine	sandy clay loam	0.32	6	2-8		0.6-2
(2.4 %)	Pring	sandy loam	0.2	10	2-8		2-6
	Archin	loam	0.43	12	2-8	0-2	0.6-2
MT027	Bainville	loam	0.37	4	2-15		0.6-2
(2.4 %)	Rock Outcrop	unweathered bedrock	0	60	25-60		0.6-2
	Mcrae	loam	0.37	5	7-15	0-2	0.6-2
MT003	Absarokee	clay loam	0.32	8	2-50	0-2	0.6-2
(2.3 %)	Castner	channery loam	0.2	6	15-50		0.6-2
	Sinnigam	clay loam	0.37	6	2-15		0.06-0.2
MT048	Bitton	channery loam	0.24	11	25-70	0-2	2-6
(2.2 %)	Shambo	loam	0.37	5	0-8		0.6-2
	Doney	loam	0.37	4	2-70	0-2	0.6-2
MT338	Lisam	clay	0.37	3	4-35	0-2	0.06-0.2
(1.6 %)	Abor	clay	0.37	6	4-15	0-4	0.2-0.6
	Vanda	clay	0.37	4	0-8	2-8	0.01-0.06
MT083	Cabba	silt loam	0.37	3	15-50	0-4	0.6-2
(1.6 %)	Ringling	channery loam	0.17	5	6-50		0.6-2
	Yawdim	clay loam	0.37	3	8-70		0.2-0.6
MT097	Cabbart	loam	0.37	3	8-35	0-4	0.6-2
(1.5 %)	Rentsac	channery loam	0.2	7	8-35		2-6
	Delpoint	loam	0.37	3	8-15	0-4	0.6-2
MT164	Delpoint	loam	0.37	3	2-15	0-4	0.6-2
(1.4 %)	Cabbart	loam	0.37	3	2-35	0-4	0.6-2
	Yamac	loam	0.37	5	2-15		0.6-2
MT218	Shadow	very channery loam	0.1	3	25-60		2-6
(1.3 %)	Macfarlane	extremely stony loam	0.05	18	25-50		2-6
	Garlet	stony loam	0.2	4	25-60		0.6-2
MT407	Moyerson	silty clay loam	0.32	4	4-50	0-4	0.06-0.2
(1.3 %)	Orinoco	silty clay loam	0.32	7	2-15		0.2-0.6
	Rock Outcrop	unweathered bedrock	0	60	0-99		0.2-0.6

TABLE SOIL-2
SOIL SERIES CHARACTERISTICS FOR POWDER RIVER & BILLINGS RMP AREAS

STATSGO Map Unit	Major Soil Series	Surface Texture	K-factor[1]	Depth (in)	Slope (%)	Salinity[2] (mmhos/cm)	Permeability (in/hr)
MT488	Midway	silty clay loam	0.43	3	15-45	2-4	0.2-0.6
(1.2 %)	Travessilla Family	silt loam	0.32	2	15-70		0.6-2
	Rock Outcrop	unweathered bedrock	0	60	0-99		0.6-2
MT175	Doney	loam	0.37	4	8-70	0-2	0.6-2
(1.2 %)	Wayden	silty clay loam	0.37	6	8-35	0-4	0.6-2
	Shaak	clay loam	0.37	6	1-15		0.06-0.2
MT550	Sweetgrass	gravelly loam	0.17	4	0-4		0.6-2
(1.2 %)	Hilger	very stony loam	0.2	5	2-4		0.6-2
	Fairfield	clay loam	0.17	7	2-4		0.6-2
MT167	Travessilla Family	fine sandy loam	0.2	2	8-35		2-6
(1.1 %)	Delpoint	loam	0.37	3	8-15	0-4	0.6-2
	Cabbart	loam	0.37	3	8-35	0-4	0.6-2
MT680	Yawdim	silty clay	0.32	3	4-15		0.06-0.2
(1.1 %)	Orinoco	silty clay	0.28	7	4-15		0.2-0.6
	Amherst	clay loam	0.32	5	1-15		0.6-2
MT668	Yamac	loam	0.37	5	0-8		0.6-2
(1.1 %)	Havre	silty clay loam	0.32	8	0-2	0-2	0.2-0.6
	Birney	channery-loam	0.2	5	15-35	0-2	0.6-2

Source: USDA NRCS State Soil Geographic Database 1996

Note: Only the top 25 Map Units based on total acreage are included (percent in parenthesis). 58 percent of the soils in the study area are represented.

[1] Soil erosion factor indicates the susceptibility of a soil to sheet and rill erosion. Possible range of values is from 0.02 to 0.69, with higher values being more susceptible to erosion.

[2] Measure of the amount of soluble salts in a soil at saturation, also expressed as electrical conductivity (EC).

SOLID AND HAZARDOUS WASTE APPENDIX

SOLID AND HAZARDOUS WASTE APPENDIX

The Toxics Release Inventory (TRI) provides state reports about releases and transfers of chemicals and compounds. Each report contains overall state information regarding releases and transfers, a list of the top five chemicals released or transferred, off-site, in that state, and a list of the top ten facilities that released or transferred, off-site, the greatest amount of chemicals. All chemical and facility information was taken directly from the Envirofacts TRI database maintained by the U.S. Environmental Protection Agency (EPA).

TRI State Report Descriptions

This is a brief description of the TRI State Reports. A brief explanation of each column heading is given.

State Information

This is general TRI information relating to the state.

- Total Facilities—The total facilities reporting in that state.
- Total Forms—The total number of forms submitted. Each form has a unique Document Control Number.
- Total Forms A's—The total number of short forms submitted.
- Transfer into State—The total amount of waste chemicals (in pounds) transferred into the state.
- Transfer out of State—The total amount of waste chemicals (in pounds) transferred out of the state.
- Population—The population of a state as reported by the U.S. Census Bureau for 1990.

Reported Releases and Waste Management Activities

On-Site Releases

The amount of chemicals released as reported by facilities in that state.

- Air Emissions—Total on-site releases of a particular type in pounds where the environmental medium = 'AIR'.
- Surface Water Discharges—Total on-site releases of a particular type in pounds where the environmental medium = 'WATER'.
- Underground Injection—Total on-site releases of a particular type in pounds where the environmental medium = 'UNINJ I' or 'UNINJ IIV'.
  - Class I Wells—Total on-site releases of a particular type in pounds where the environmental medium = 'UNINJ I'.
  - Class II-V Wells—Total on-site releases of a particular type in pounds where the environmental medium = 'UNINJ IIV'.
- Releases to Land—Total on-site releases of a particular type in pounds where the environmental medium = 'RCRA C' or 'OTH LANDF'.
  - RCRA Subtitle C Landfills—Total on-site releases of a particular type in pounds where the environmental medium = 'RCRA C'.
  - Other On-Site Land Releases—Total on-site releases of a particular type in pounds where the environmental medium = 'OTH LANDF'.
- Total On-Site Releases—The sum of Air Emissions, Surfaces Water Discharges, Underground Injection, and Releases to Land.
- Transfer Off-Site to Disposal—Total off-site transfer of a particular type in pounds for disposal.
- Total On and Off-Site Releases—Sum of total on-site releases and off-site transfers.

Off-Site Releases (Transfers Off-Site to Disposal)

- POTWs (metals and metal compounds)—Total transfer of metals and metal compounds in pounds to POTWs as offsite releases.

- Transfer Off-Site to Disposal—Total off-site transfer of a particular type in pounds for disposal.
- Total Off-Site Releases—Sum of total POTW's (metals and metal compounds) and off-site transfers to disposals.
- Total Releases—Sum of total on-site and off-site releases.

Source Reduction Activities

- Energy Recovery On-Site—The total amount of the toxic chemical in waste burned for energy recovery onsite, reported in section 8.2 of Form R.
- Energy Recovery Off-Site—The total amount of the toxic chemical in waste sent offsite to be burned for energy recovery, reported in section 8.3 of Form R.
- Recycling On-Site—The total amount of the toxic chemical recycled onsite, reported in section 8.4 of Form R.
- Recycling Off-Site—The total amount of the toxic chemical sent offsite for recycling, reported in section 8.5 of Form R.
- Treatment On-Site—The total amount of the toxic chemical treated onsite, reported in section 8.6 of Form R.
- Treatment Off-Site—The total amount of the toxic chemical treated offsite, reported in section 8.7 of Form R.
- Total Releases—The total amount of the toxic chemical released due to production related events by the facility to all environmental media both on and off site, reported in section 8.1 of Form R.
- Total Production Related Waste Managed—The sum of recycling, energy recovery, treatment, and total releases.

Transfers Off-Site to POTW's

- Metals and Metal Compounds—Total transfer of metals and metals compounds in pounds to POTW's as an off-site releases.
- Non-Metal TRI Chemicals—Total off-site transfer of non-metals in pounds to a POTW's as an off-site release.
- Total Transfers Off-site to POTW's—Sum of total off-site transfers of Metals and Non-Metals to POTW's.

Top Ten Chemicals for Air/Water/Land/Underground Injection Releases and the Top Ten Chemicals for Total On and Off-Site Releases

The waste chemicals that are most released into the environment for that state.

- Chemical—The name of the chemical.
- Air Emissions—Total on-site releases of a particular type in pounds where the environmental medium = 'AIR'.
- Surface Water Discharges—Total on-site releases of a particular type in pounds where the environmental medium = 'WATER'.
- Underground Injection—Total on-site releases of a particular type in pounds where the environmental medium = 'UNINJ I' or 'UNINJ IIV'.
  - Class I Wells—Total on-site releases of a particular type in pounds where the environmental medium = 'UNINJ I'.
  - Class II-V Wells—Total on-site releases of a particular type in pounds where the environmental medium = 'UNINJ IIV'.
- Releases to Lands—Total on-site releases of a particular type in pounds where the environmental medium = 'RCRA C' or 'OTH LANDF'.
  - RCRA Subtitle C Landfills—Total on-site releases of a particular type in pounds where the environmental medium = 'RCRA C'.
  - Other On-Site Land Release—Total on-site releases of a particular type in pounds where the environmental medium = 'OTH LANDF'.
- Total On-site Releases—The sum of Air Emissions, Surfaces Water Discharges, Underground Injection, and Releases to Land.

- Transfers Off-Site to Disposal—Total off-site transfer of a particular type in pounds for disposal.
- Total On and Off-site Releases—Sum of total on-site releases and off-site transfers.

Top Ten Facilities for Air/Water/Land/Underground Injection Releases and the Top Ten Facilities for Total On and Off-site Release

The facilities that release the most waste chemicals into the environment for that state.

- Facility—The name of the facility.
- City, County—The city name and the county name where the facility is located.
- Air Emissions—Total on-site releases in pounds by a facility where the environmental medium = 'AIR'.
- Surface Water Discharge—Total on-site releases in pounds by a facility where the environmental medium = 'WATER'.
- Underground Injection—Total on-site releases in pounds by a facility where the environmental medium = 'UNINJ I' or 'UNINJ IIV'.
  - Class I Wells—Total on-site releases in pounds by a facility where the environmental medium = 'UNINJ I'.
  - Class II-V Wells—Total on-site releases in pounds by a facility where the environmental medium = 'UNINJ IIV'.
- Releases to Land—Total on-site releases in pounds by a facility where the environmental medium = 'RCRA C' or 'OTH LANDF'.
  - RCRA Subtitle C Landfills—Total on-site releases in pounds by a facility where the environmental medium = 'RCRA C'.
  - Other On-Site Land Releases—Total on-site releases in pounds by a facility where the environmental medium = 'OTH LANDF'.
- Total On-site Releases—The sum of Air Emissions, Surfaces Water Discharges, Underground Injection, and Releases to Land by a facility.
- Transfers Off-Site to Disposal—Total off-site transfer in pounds for disposal by a facility.
- Total On and Off-site Releases—Sum of total on-site releases and off-site transfers by a facility.

The following table contains the EPA's Toxics Release Inventory information for Montana for the year 2001 (2001 is the latest year for which a published report is available). More recent information up to year 2003 is available from EPA's website at: http://www.epa.gov/triexplorer/.

2001 Toxics Release Inventory

MONTANA

Reported Releases and Other Waste Management Activities (in pounds)

	Total
On-site Releases	62,744,079
Air Emissions	4,292,997
Surface Water Discharges	48,785
Underground Injection Class I Wells	0
Underground Injection Class II-V Wells	369,092
On-site Land Releases to RCRA Subtitle C Landfills	2,395
Other On-site Land Releases	58,030,810
Off-site Releases (Transfers Off-site to Disposal)*	2,644,099
Total On- and Off-site Releases	**65,388,178**
Recycled On-site	8,626,607
Recycled Off-site	62,534
Energy Recovery On-site	3,948,532
Energy Recovery Off-site	41,063
Treated On-site	10,499,243
Treated Off-site**	36,449
Quantity Released On- and Off-site***	51,214,536
Total Production-related Waste Managed	**74,428,965**
Non-production-related Waste Managed	**12,029,507**
Transfers Off-site for Further Waste Management, including Disposal	
Recycling	102,939
Energy Recovery	36,638
Treatment	39,313
Publicly Owned Treatment Works (POTWs)	1,619
Metals and Metal Category Compounds*	14
Non-metal TRI Chemicals**	1,605
Other Off-site Transfers****	227,840
Transfers Off-site to Disposal *(not including metals to POTWs)*	2,808,061
Total Transfers Off-site for Further Waste Management, including Disposal	**3,216,411**

* Transfers to POTWs of metals and metal category compounds are included in off-site releases. Excludes transfer amounts sent for disposal to other TRI facilities reporting that amount released on-site.
** Transfers to POTWs of non-metals are included in treated off-site waste management activity.
*** Excludes non-production-related releases; e.g. releases due to catastrophic events or remedial actions.
**** Transfers reported without a valid waste management code.

For More Information . . .

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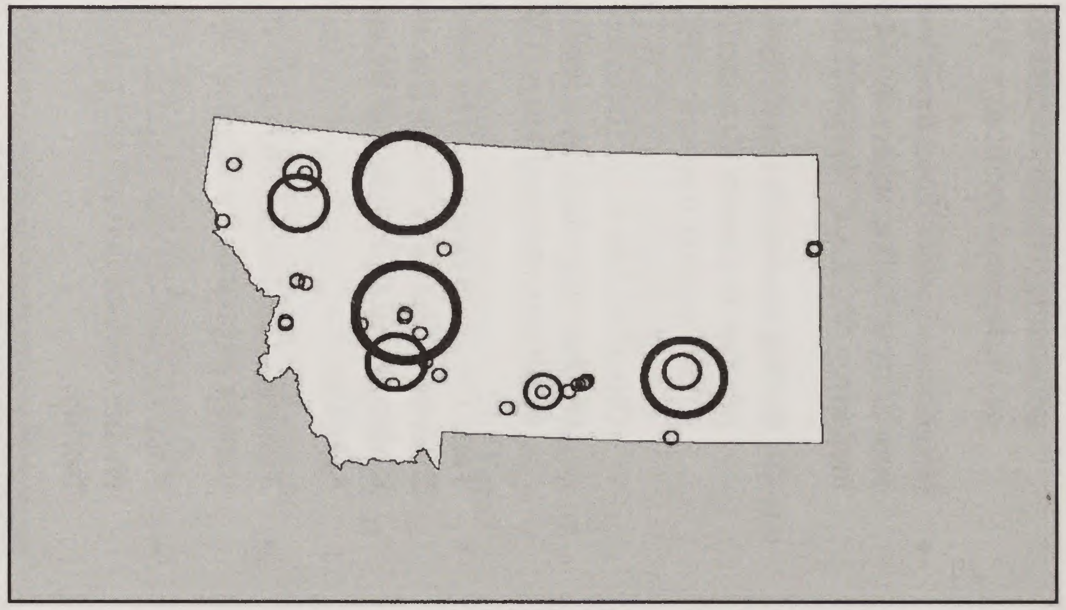
To obtain TRI data use assistance, call TRI User Support Service (TRI-US):
(202) 566-0250
tri.us@epa.gov



The largest circle in the state map represents the largest facility for on-site releases in the state of Montana. All circles are proportionally-sized to represent the on-site releases at each facility within this state.

State/TRI Data	
Population	905,382
Square Miles	145,556
Total Facilities	49
Total Forms	293
Form As	34

	Total
National Rank for Total On- and Off-site Releases*	
Rank	25
Pounds	65,388,178
National Rank for Total On-site Releases**	
Rank	25
Pounds	62,744,079
National Rank for Total Releases within State***	
Rank	25
Pounds	63,507,964
National Rank for Production-related Waste Managed	
Rank	44
Pounds	74,428,965

* Includes transfers out-of-state for disposal. Excludes transfer amounts sent for disposal to other TRI facilities reporting that amount released on-site.
** Includes amounts released at the facility. Excludes amounts transferred to other sites.
*** Excludes transfers for disposal sent out-of-state or sent to other TRI facilities within the state reporting that amount released on-site.

2001 Toxics Release Inventory — MONTANA

On-site and Off-site Releases for Top Five Chemicals Ranked on Total Releases in the State (All Chemicals)

CAS Number	Chemical	On-site Releases: Air Emissions Pounds	On-site Releases: Surface Water Discharges Pounds	On-site Releases: Underground Injection Pounds	On-site Releases: On-site Releases to Land Pounds	Off-site Releases: Transfers Off-site to Disposal* Pounds	Total Releases in the State** Pounds	Off-site Transfers to Disposal: Transferred Into State Pounds	Off-site Transfers to Disposal: Transferred Within State Pounds	Off-site Transfers to Disposal: Transferred Out of State Pounds
—	Zinc compounds	6,624	14	0	24,009,658	763,254	24,779,550	92,100	1,555	761,699
—	Lead compounds	6,913	349	10,813	14,054,719	791,161	14,863,955	48,301	7,297	783,864
—	Barium compounds	89,853	5	0	8,290,628	278,000	8,658,486	0	278,000	0
—	Copper compounds	12,595	10	47,757	3,385,422	40,273	3,486,057	19,800	23,677	16,596
—	Manganese compounds	10,975	24,006	0	2,855,009	48,827	2,938,817	150	47,505	1,322

On-site and Off-site Releases for PBT Chemicals Ranked on Total Releases in the State

CAS Number	Chemical	On-site Releases: Air Emissions Pounds	On-site Releases: Surface Water Discharges Pounds	On-site Releases: Underground Injection Pounds	On-site Releases: On-site Releases to Land Pounds	Off-site Releases: Transfers Off-site to Disposal* Pounds	Total Releases in the State** Pounds	Off-site Transfers to Disposal: Transferred Into State Pounds	Off-site Transfers to Disposal: Transferred Within State Pounds	Off-site Transfers to Disposal: Transferred Out of State Pounds
—	Lead compounds	6,913.38	349.20	10,813.00	14,054,718.70	791,160.58	14,863,954.86	48,301.20	7,296.90	783,863.68
7439-92-1	Lead	327.70	24.00	0.00	82,820.00	1,238.40	84,410.10	0.00	1,238.40	0.00
—	Mercury compounds	1,772.40	0.04	18.00	7,159.50	426.41	9,376.35	0.00	31.00	395.41
—	Polycyclic aromatic compounds	2,213.19	7.00	0.00	885.80	50.90	3,156.89	0.00	22.90	28.00
7439-97-6	Mercury	69.80	2.40	0.00	430.80	6.80	509.80	0.00	6.80	0.00
191-24-2	Benzo(g,h,i)perylene	153.71	0.00	0.00	0.30	2.20	156.21	0.00	1.80	0.40
118-74-1	Hexachlorobenzene	11.70	0.00	0.00	0.00	0.00	11.70	0.00	0.00	0.00
—	Dioxin and dioxin-like compounds	0.04	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00
—	*Dioxin and dioxin-like compounds (in grams)*	*17.593*	*0.162*	*0.000*	*0.049*	*0.152*	*17.956*	*0.000*	*0.152*	*0.000*
309-00-2	Aldrin	—***	—	—	—	—	—	—	—	—
57-74-9	Chlordane	—***	—	—	—	—	—	—	—	—
76-44-8	Heptachlor	—***	—	—	—	—	—	—	—	—
465-73-6	Isodrin	—***	—	—	—	—	—	—	—	—
72-43-5	Methoxychlor	—***	—	—	—	—	—	—	—	—
29082-74-4	Octachlorostyrene	—***	—	—	—	—	—	—	—	—
40487-42-1	Pendimethalin	—***	—	—	—	—	—	—	—	—
608-93-5	Pentachlorobenzene	—***	—	—	—	—	—	—	—	—
1336-36-3	Polychlorinated biphenyls (PCBs)	—***	—	—	—	—	—	—	—	—
79-94-7	Tetrabromobisphenol A	—***	—	—	—	—	—	—	—	—
8001-35-2	Toxaphene	—***	—	—	—	—	—	—	—	—
1582-09-8	Trifluralin	—***	—	—	—	—	—	—	—	—

* Excludes amounts transferred to other TRI facilities in the state reporting that amount released on-site.

** The chemical ranking is based on the amounts in this column.

*** No reports were submitted for these chemicals.

2001 Toxics Release Inventory — MONTANA

On-site and Off-site Releases for Top Ten Facilities Ranked on Total On-site Releases in the State (All Chemicals)

Facility, City, County	On-site Releases		Underground Injection		On-site Releases to Land		Total	Off-site Releases (Transfers Off-site to Disposal)	
	Air Emissions Pounds	Surface Water Discharges Pounds	Class I Wells Pounds	Class II-V Wells Pounds	RCRA Subtitle C Landfills Pounds	Other On-site Land Releases Pounds	Total On-site Releases* Pounds	Transferred Within State Pounds	Transferred Out of State Pounds
Montana Tunnels Mining Inc., Jefferson City, Jefferson	9,850	0	0	0	0	23,633,174	23,643,024	0	0
ASARCO Inc., East Helena, Lewis And Clark	12,252	166	0	0	0	20,063,922	20,076,340	0	2,194,380
Colstrip Steam Electric Station, Colstrip, Rosebud	286,163	0	0	0	0	10,819,248	11,105,411	254,951	25
Golden Sunlight Mines Inc., Whitehall, Jefferson	54,580	0	0	0	0	2,548,199	2,602,779	0	0
Stone Container Corp., Missoula, Missoula	1,443,054	32,691	0	0	0	31,419	1,507,164	670	255
Colstrip Energy L.P. Rosebud Power Plant, Colstrip, Rosebud	585,297	0	0	0	0	171,592	756,889	0	0
SMC Nye Mine Site, Nye, Stillwater	21	0	0	369,092	0	362,498	731,611	175,148	1
Plum Creek Mdf Inc., Columbia Falls, Flathead	697,550	0	0	0	0	0	697,550	0	0
Conoco Inc. Billings Refy., Billings, Yellowstone	236,466	306	0	0	0	0	236,772	0	0
Stillwater Mining Co. East Boulder Ops., Big Timber, Sweet Grass	247	0	0	0	0	225,583	225,830	0	0

On-site and Off-site Releases for Top Ten Facilities Ranked on Total On-site Releases in the State (PBT Chemicals)

Facility, City, County	On-site Releases		Underground Injection		On-site Releases to Land		Total	Off-site Releases (Transfers Off-site to Disposal)	
	Air Emissions Pounds	Surface Water Discharges Pounds	Class I Wells Pounds	Class II-V Wells Pounds	RCRA Subtitle C Landfills Pounds	Other On-site Land Releases Pounds	Total On-site Releases* Pounds	Transferred Within State Pounds	Transferred Out of State Pounds
Montana Tunnels Mining Inc., Jefferson City, Jefferson	169.20	0.00	0.00	0.00	0.00	8,187,629.00	8,187,798.20	0.00	0.00
ASARCO Inc., East Helena, Lewis And Clark	4,336.00	1.00	0.00	0.00	0.00	5,776,075.00	5,780,412.00	0.00	784,237.00
Golden Sunlight Mines Inc., Whitehall, Jefferson	8.10	0.00	0.00	0.00	0.00	82,429.00	82,437.10	0.00	0.00
Colstrip Steam Electric Station, Colstrip, Rosebud	1,728.46	0.00	0.00	0.00	0.00	54,348.00	56,076.46	701.00	5.12
SMC Nye Mine Site, Nye, Stillwater	0.87	0.00	0.00	10,831.00	0.00	19,498.00	30,329.87	4,949.00	1.00
Colstrip Energy L.P. Rosebud Power Plant, Colstrip, Rosebud	1,627.00	0.00	0.00	0.00	0.00	13,473.00	15,100.00	0.00	0.00
Stillwater Mining Co. East Boulder Ops., Big Timber, Sweet Grass	9.00	0.00	0.00	0.00	0.00	9,295.00	9,304.00	0.00	0.00
Columbia Falls Aluminum Co. L.L.C., Columbia Falls, Flathead	1,501.00	0.00	0.00	0.00	0.00	743.00	2,244.00	0.00	0.00
Lewis & Clark Station, Sidney, Richland	85.00	26.40	0.00	0.00	0.00	824.40	935.80	1,058.00	0.00
Stone Container Corp., Missoula, Missoula	190.90	351.20	0.00	0.00	0.00	153.60	695.70	664.80	0.00

* The facility ranking is based on the amounts in this column; these quantities exclude transfers out of state.

2001 Toxics Release Inventory — MONTANA

Total Production-related Waste for Top Ten Facilities Ranked on Quantity Released On- and Off-site (All Chemicals)

Facility, City, County	Recycled On-site Pounds	Recycled Off-site Pounds	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds	Treated On-site Pounds	Treated Off-site Pounds	Quantity Released On- and Off-site* Pounds	Total Production-related Waste Managed Pounds	Total Non-Production-related Waste Managed Pounds
Montana Tunnels Mining Inc., Jefferson City, Jefferson	0	25,815	0	0	0	0	20,682,625	20,708,440	702,662
Colstrip Steam Electric Station, Colstrip, Rosebud	0	1,601	0	0	2,500,000	474	11,344,890	13,846,966	0
ASARCO Inc., East Helena, Lewis And Clark	6,898,619	0	0	0	0	0	10,944,629	17,843,248	11,326,091
Golden Sunlight Mines Inc., Whitehall, Jefferson	0	0	0	0	0	0	2,579,389	2,579,389	0
Stone Container Corp., Missoula, Missoula	0	0	3,470,000	428	2,840,891	1	1,499,381	7,810,700	0
SMC Nye Mine Site, Nye, Stillwater	423	0	0	0	23,096	0	906,760	930,279	0
Colstrip Energy L.P. Rosebud Power Plant, Colstrip, Rosebud	0	0	0	0	0	0	756,889	756,889	0
Plum Creek Mdf Inc., Columbia Falls, Flathead	0	0	0	0	0	0	696,300	696,300	0
Conoco Inc. Billings Refy., Billings, Yellowstone	0	50	0	0	9,020	4,305	236,773	250,148	0
Stillwater Mining Co. East Boulder Ops., Big Timber, Sweet Grass	0	0	0	0	0	0	225,830	225,830	0

Total Production-related Waste for Top Ten Facilities Ranked on Quantity Released On- and Off-site (PBT Chemicals)

Facility, City, County	Recycled On-site Pounds	Recycled Off-site Pounds	Energy Recovery On-site Pounds	Energy Recovery Off-site Pounds	Treated On-site Pounds	Treated Off-site Pounds	Quantity Released On- and Off-site* Pounds	Total Production-related Waste Managed Pounds	Total Non-Production-related Waste Managed Pounds
Montana Tunnels Mining Inc., Jefferson City, Jefferson	0.00	0.00	0.00	0.00	0.00	0.00	5,491,146.00	5,491,146.00	443,932.00
ASARCO Inc., East Helena, Lewis And Clark	4,643,364.00	0.00	0.00	0.00	0.00	0.00	1,322,530.00	5,965,894.00	5,242,119.00
Golden Sunlight Mines Inc., Whitehall, Jefferson	0.00	0.00	0.00	0.00	0.00	0.00	82,429.00	82,429.00	0.00
Colstrip Steam Electric Station, Colstrip, Rosebud	0.00	1.00	0.00	0.00	0.00	5.00	56,776.00	56,783.00	0.00
SMC Nye Mine Site, Nye, Stillwater	1.00	0.00	0.00	0.00	0.00	0.00	35,280.00	35,281.00	0.00
Colstrip Energy L.P. Rosebud Power Plant, Colstrip, Rosebud	0.00	0.00	0.00	0.00	0.00	0.00	15,100.00	15,100.00	0.00
Holcim Trident Plant, Three Forks, Gallatin	0.00	0.00	0.00	0.00	0.00	0.00	14,561.00	14,561.00	0.00
Stillwater Mining Co. East Boulder Ops., Big Timber, Sweet Grass	0.00	0.00	0.00	0.00	0.00	0.00	9,304.00	9,304.00	0.00
Columbia Falls Aluminum Co. L.L.C., Columbia Falls, Flathead	178.00	0.00	0.00	0.00	0.00	0.00	2,244.00	2,422.00	0.00
Lewis & Clark Station, Sidney, Richland	0.00	0.00	0.00	0.00	0.00	0.00	1,994.00	1,994.00	0.00

* The facility ranking is based on the amounts in this column; these quantities exclude non-production-related releases.

VEGETATION APPENDIX

VEGETATION APPENDIX

Habitat Types and Biological Diversity

The land classification system developed by the University of Montana, Montana Gap Analysis Project (MT-GAP), was used to estimate acreages listed for this Appendix (Fisher et al. 1998).

Grasslands

Grasslands cover approximately 7.9 million acres of the 13-county CBNG Planning Area. Of this acreage, 2.6 million acres are underlain by subbituminous or bituminous coal deposits. Grasslands are divided into five types (see Table VEG-1). Species richness data for these types are provided.

Altered herbaceous habitats include grasslands with 30 percent or more cover from introduced species and/or noxious weed species such as thistle (*Cirsium* spp.), cheat grass (*Bromus tectorum*), Japanese brome (*B. japonicus*), spotted knapweed (*Centaurea maculosa*), crested wheatgrass (*Agropyron cristatum*) or yellow sweetclover (*Melilotus officinalis*). Total herbaceous cover ranges from 20 to 80 percent on these sites, which are usually associated with disturbance and can have bare ground coverages in the 10 to 50 percent range (Fisher et al. 1998).

Very Low Cover Grasslands are semi-desert grasslands with total grass cover of 10 to 30 percent. They are dominated by short grasses and forbs such as blue grama (*Bouteloua gracilis*). These grasslands typically have a high amount of bare soil (20 to 60 percent) (Fisher et al. 1998).

Low to Moderate Cover Grasslands are the most abundant grassland type in Montana. They are the category that has the greatest potential for impact from CBM extraction (see Table VEG-1). Total grass coverages on these sites range from 20 to 70 percent and are dominated by short- to medium-height grasses and forbs, such as blue grama, green needlegrass (*Stipa viridula*), Idaho fescue (*Festuca idahoensis*), lupine (*Lupinus* spp.), arrowleaf balsamroot (*Balsamorhiza sagittata*), and bluebunch wheatgrass (*Agropyron spicatum*) (Fisher et al. 1998).

Moderate to High Cover Grasslands are dominated by medium to tall grass species, such as bluebunch wheatgrass, green needlegrass, big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), little bluestem (*Andropogon scoparium*), and needle and thread (*Stipa comata*). Grass coverage on these grasslands ranges from 50 to 100 percent (Fisher et al. 1998).

Montane Parklands and Subalpine Meadows are the final type of grasslands classification for Montana lands. Total herbaceous cover in these moist locations can range from 30 to 100 percent and are dominated by species such as beargrass (*Xerophyllum tenax*), several species of sedge (*Carex* spp.), pinegrass (*Calamagrostis rubescens*), arnica (*Arnica* spp.), and subalpine daisy (*Erigeron peregrinus*) (Fisher et al. 1998).

Shrublands

Of the 4.8 million acres designated as shrubland in the CBNG Planning Area, approximately 1.7 million acres are underlain by bituminous coal deposits. Shrublands in Montana are divided into seven categories: Mixed Mesic Shrubs, Mixed Xeric Shrubs, Silver Sage, Salt-Desert Shrubs, Mesic-Grassland Shrubs, Xeric-Grassland Shrubs, and Sagebrush (see Table VEG-2).

Mixed Mesic Shrub sites are characterized by 20 to 100 percent shrub cover. Dominant shrubs on these sites are alder (*Alnus* spp.), ceanothus (*Ceanothus* spp), huckleberry (*Vaccinium* spp.), ninebark (*Physocarpus malvaceus*), snowberry (*Symphoricarpos* spp.), and western serviceberry (*Amelanchier alnifolia*).

Mixed Xeric Shrub sites are characterized by shrub cover ranging from 20 to 50 percent. Dominant shrubs for this type are bitterbrush (*Purshia tridentata*), creeping juniper (*Juniperus horizontalis*), greasewood (*Sarcobatus* spp.), mountain mahogany (*Cercocarpus* spp.), and rabbitbrush (*Chrysothamnus* spp.). Associated grass species cover from 5 to 40 percent of these sites and are predominantly bluebunch wheatgrass, blue grama, Idaho fescue, and western wheatgrass (*Agropyron smithii*).

Silver Sage sites are dominated by silver sage (*Artemisia cana*). This alkali-tolerant species is most abundant in the northeastern part of Montana on moist sites near riparian areas.

Salt-Desert Shrub and Dry Salt Flat sites are dominated by Saltsage (*Atriplex nuttallii*) at 10 to 40 percent cover. These sites are usually underlain by alkali-affected soils in dry, sandy, or saline-seep areas. Species associated with these sites are blue grama, Sandberg's bluegrass (*Poa secunda*), and threadleaf sedge (*Carex filifolia*). It occurs mainly in eastern and southeastern Montana.

Mesic Shrub-Grassland Associations are shrublands with co-dominance between shrubs and grasses that together cover 10 to 50 percent of the site. These are moist, ecotonal areas between shrub-dominated and grass-dominated sites. The grass and shrub species are those found in the respective classes that make up the association.

Xeric Shrub-Grassland Associations are shrublands with a co-dominance of xeric shrubs and grass species in the ecotone between grass- and xeric shrub-dominated sites with the same dominant species as those types. Cover of both shrubs and grasses on these sites range from 10 to 50 percent.

Sagebrush shrubland sites are dominated by big sagebrush (*Artemisia tridentata* spp. *tridentata*, *vaseyana*, and *wyomingensis*) and black sagebrush (*Artemisia nova*) at 20 to 80 percent cover. These are associated with the same grass species listed under the Mixed Xeric Shrub habitat type. Sagebrush shrublands are particularly characteristic of the counties that make up the CBNG Planning Area where more than 33 percent (1.6 million acres) of shrublands fall within this category (Fisher et al. 1998).

Forests

Of the 2.8 million acres classified as forest in the CBNG Planning Area, almost 1.3 million acres are underlain by subbituminous or bituminous coal deposits. The acreages underlain with these coal beds within each forest type in the 13 counties affected by this project are given in Table VEG-3.

Riparian Areas

Riparian areas cover about 1.0 million acres within the CBNG Planning Area. Almost 270,000 acres are underlain by subbituminous or bituminous coal beds.

Table VEG-4 gives the breakdown by type for riparian areas in the project area that are underlain by coal beds. The types with the most acreage are in the Graminoid and Forb and the Shrub categories.

Graminoid and Forb Riparian areas are characterized by herbaceous species at 30 to 100 percent cover and less than 15 percent cover of shrubs and trees. Standing water may be present in areas with cattail marshes. Plant species associated with this type are sedges (*Carex* spp.), cattails (*Typha* spp.), reedgrass (*Calamagrostis* spp.), rushes (*Juncus* spp.), saxifrage (*Saxifraga* spp.), and tufted hairgrass (*Deschampsia caespitosa*).

Shrub Riparian sites are dominated by shrub cover at 20 to 100 percent and tree cover at less than 15 percent. Standing water may be present in willow marshes in this category. Shrub species potentially present on shrub-dominated sites include alder (*Alnus* spp.), black hawthorn (*Crataegus douglasii*), birch (*Betula* spp.), currant (*Ribes* spp.), red-osier dogwood (*Cornus stolonifera*), rose (*Rosa* spp.), shrubby cinquefoil (*Potentilla fruticosa*), snowberry (*Symphoricarpos* spp.), thimbleberry (*Rubus parviflorum*), twinberry (*Lonicera involucrata*), Utah honeysuckle (*Lonicera utahensis*), and willows (*Salix* spp.) (Fisher et al. 1998).

Barren Lands

Table VEG-5 shows that one classification, Badlands, has a significant number of species associated with it.

Additional Tables

Additional Tables within this appendix include Tables VEG-6, VEG-7 and VEG-8; Table VEG-6 shows critically imperiled plant species in the state with potential habitat in the CBNG Planning Area, Table VEG-7 shows noxious weeds found in the state, and Table VEG-8 indicates plant species of special concern by county within the project area.

TABLE VEG-1
GRASSLAND TYPES AND ASSOCIATED WILDLIFE DIVERSITY

Grassland Types	Total Acres In Project Area With Underlying Subbituminous or Bituminous Coal Beds	Distribution	Species Richness*
Altered Herbaceous Habitats	36,969	Found throughout Montana, but most concentrated in the northeastern part of the state.	66
Very Low Cover Grasslands	202,556	Associated with alkaline soils or with disturbance.	68
Low to Moderate Cover Grasslands	2,170,236	Occurs across the state in valleys and foothills and on south aspects in the mountains.	78
Moderate to High Cover Grasslands	141,856	Associated with wet sites primarily in the valleys of central and eastern Montana.	72
Montane Parklands and Subalpine Meadows	7,323	Found at mid- to upper elevations either within forests or above timberline.	62

*Mean number of native terrestrial vertebrates species predicted by habitat type (Fisher et al. 1998). Species richness estimates are simple species counts and not intended to imply that areas with fewer species are not as important as areas with larger numbers of species.

TABLE VEG-2
SHRUBLAND TYPES AND ASSOCIATED DISTRIBUTION AND SPECIES RICHNESS

Shrubland Types	Total Acres In Project Area With Underlying Subbituminous or Bituminous Coal Beds	Distribution	Species Richness*
Mixed Mesic Shrub	175,171	Found in western Montana and in draws or north slopes in eastern Montana	63
Mixed Xeric Shrub	668,043	Occur on dry rocky sites in valleys and low elevation mountain slopes.	75
Silver Sage	3,310	Primarily found in northeastern Montana on moist sites near riparian areas.	61
Salt-Desert Shrub and Dry Salt Flat	45,920	Usually associated with alkaline sites or blowouts in dry, sandy, or saline-seep areas in eastern Montana.	29
Sagebrush	525,753	Occur across the state in valleys and low- to mid-elevational mountain slopes.	74
Mesic Shrub-Grassland Associations	116,813	Found in central and eastern Montana valleys and some low mountain slope areas in moist ecotonal areas between shrub-dominated and grass-dominated sites.	75
Xeric Shrub-Grassland Associations	123,046	Occur primarily in eastern and central Montana valleys and some low mountain slopes on dry sites in valleys, in the ecotone between grass and xeric shrub dominated sites.	85

*Mean number of native terrestrial vertebrates species predicted by habitat type for Montana (Fisher et al. 1998).

TABLE VEG-3
FOREST TYPES IN THE PROJECT AREA UNDERLAIN BY COAL BEDS

Forest Type	Total Acres In Project Area With Underlying Subbituminous or Bituminous Coal Beds	Distribution	Species Richness*
Douglas-fir (*Pseudotsuga menziesii)*	16,726	Occurs across the state, except for the northeastern corner, but primarily found in western and south-central Montana.	77
Douglas-fir with Lodgepole Pine	228	Occurs in western and south-central Montana on mid-upper elevational slopes.	72
Limber Pine *(Pinus flexilis)*	4,838	Dry forest sites at lower elevations in central Montana and at higher elevations on limestone soils in central and eastern Montana.	53
Lodgepole Pine *(Pinus contorta)*	781	Occurs primarily in western and south-central Montana in mountainous regions at cooler, mid-high elevations.	65
Low Density Xeric Forest	303,312	Occurs primarily in eastern Montana on low hills on the edge of grasslands.	83
Mixed Broadleaf Forest	54,241	Occurs across the state, primarily in moist forest areas or near riparian areas or woody draws.	90
Mixed Broadleaf & Conifer Forest	27,761	Occurs across the state, primarily in moist forest areas, near riparian areas or in woody draws.	82
Mixed Subalpine Forest	643	Occurs at mid-high elevations in western and south-central Montana, usually on north, east, and northwest aspects.	67
Mixed Whitebark Pine Forest	10	Occurs in high elevation forest stands at or near tree line in western and south-central Montana.	39
Mixed Xeric Forest	24,910	Occurs at low-mid elevations on dry forest sites in western Montana.	76
Ponderosa Pine	840,850	Occurs across the state, except in northeastern Montana at lower elevations on dry forest sites.	79
Rocky Mountain Juniper *(Juniperus scopulorum)*	3,984	Occurs primarily in central and eastern Montana on dry forest sites.	58
Standing Burnt Forest	2,099	Occurs across the state in forested areas and includes only stands that have burned in the 5 years prior to 1998.	63
Utah Juniper *(Juniperus osteosperma)*	4,953	Occurs primarily in central and eastern Montana on dry forest sites, particularly in Carbon County.	70

*Mean number of native terrestrial vertebrate species predicted by habitat type (Fisher et al. 1998).

TABLE VEG-4
RIPARIAN AREAS IN THE PROJECT AREA UNDERLAIN BY COAL BEDS

Riparian Types	Total Acres In Project Area With Underlying Subbituminous or Bituminous Coal Beds	Distribution	Species Richness*
Conifer	138	Occurs in riparian areas in western and south-central Montana.	114
Broadleaf	36,797	Occurs in riparian areas across Montana.	123
Mixed Broadleaf & Conifer	6,131	Occurs in riparian areas of western and south-central Montana.	134
Graminoid & Forb	114,397	Occurs across the state.	72
Mixed Riparian	30,411	Occurs across the state	104
Shrub	80,233	Occurs across the state.	110

*Mean number of native terrestrial vertebrate species predicted by habitat type (Fisher et al. 1998).

TABLE VEG-5
BARREN LANDS

Barren Lands	Total Acres In Project Area With Underlying Subbituminous or Bituminous Coal Beds	Distribution	Species Richness*
Badlands	208,766	Occurs primarily in central and eastern Montana on sites where bare soil or rock is the dominant cover. Patches of grass or shrubs total less than 10 percent cover. Tree canopy is less than 10 percent on treed sites.	48
Mines, Quarries, Gravel Pits	15,247	Occurs across Montana and are as named.	13
Mixed Barren Sites	48,150	Occurs across the state where live vegetation provides less than 10 percent cover.	17
Rock	24,563	Exposed rock, cliffs, talus slopes, or scree fields across the state.	14

*Mean number of native terrestrial vertebrate species predicted by habitat type (Fisher et al. 1998).

TABLE VEG-6
STATE OF MONTANA CRITICALLY IMPERILED (S1) PLANT SPECIES WITH POTENTIAL HABITAT IN THE CBNG PLANNING AREA

Common Name (Scientific Name)	Habitat
Daggett rock cress (*Arabis demissa var languida*)	Canyon bottoms and outwash plains with dry, stony soils derived from limestone in juniper woodland.
Swamp milkweed (*Asclepias incarnata*)	Wet meadows and thickets.
Ovalleaf milkweed (*Asclepias ovalifolia*)	Open pine woodland in seasonally moist meadow in southeastern Montana.
Narrowleaf milkweed (*Asclepias stenophylla*)	Sandy soils of prairies and open pine woodland in southeastern Montana.
Wind River milkvetch (*Astragalus oreganus*)	Sandy or clayey soil in desert shrublands and sagebrush grassland in the valley zone in south-central Montana.
Small camissonia (*Camissonia parvula*)	Sandy calcareous soils of sagebrush steppe and juniper woodlands in the valleys.
Pregnant sedge (*Carex gravida*)	Open woods, often in ravines with deciduous trees, on the plains of southeastern Montana.
Toothed Scandinavian sedge (*Carex norvegica* ssp. *inserrulata*)	Moist alpine turf.
Birchleaf mountain-mahogany (*Cercocarpus montanus* var. *glaber*)	Open slopes and breaks on the plains of eastern Montana.
Smooth goosefoot (*Chenopodium subglabrum*)	Sparsely vegetated sand dunes and sandy terraces of major rivers on the plains of eastern Montana.
Yellow bee plant (*Cleome lutea*)	Open, often-sandy soil of sagebrush steppe in the valleys.
Miner's candle (*Cryptantha scoparia*)	Sandy soil of sagebrush steppe in the valleys.
Nine-anther dalea (*Dalea enneandra*)	Gravelly grasslands slopes on the plains of eastern Montana.
Silky prairie clover (*Dalea villosa* var. *villosa*)	Loose sand of sand dunes or eroded from sandstone outcrops in eastern Montana.
Scribner's panic grass (*Dichanthelium oligosanthes* var. *scribnerianum*)	Open ponderosa pine woodlands of valleys and plains.
White arctic draba (*Draba fladnizensis*)	Rocky, open soil in the alpine zone.
Porsild's draba (*Draba porsildii*)	Moist, gravelly open soils in the alpine zone.
Entire-leaved avens (*Dryas integrifolia*)	Stony, limestone-derived soil of exposed ridges and plateaus in the alpine zone.

TABLE VEG-6
STATE OF MONTANA CRITICALLY IMPERILED (S1) PLANT SPECIES WITH POTENTIAL HABITAT IN THE CBNG PLANNING AREA

Common Name (Scientific Name)	Habitat
Eaton's daisy (*Erigeron eatonii* ssp. *eatonii*)	Open areas in mountains and foothills.
Beautiful fleabane (*Erigeron formosissimus* var. *viscidus*)	Meadows and forest openings in the montane and subalpine zones.
Smooth buckwheat (*Eriogonum salsuginosum*)	Barren, often bentonitic soil of badlands in the valleys.
Visher's buckwheat (*Eriogonum visheri*)	Barren, often bentonitic badlands slopes and outwashes in the plains.
Sheared cotton-grass (*Eriophorum calllitrix*)	Wet, organic soil of fens and seep areas in alpine tundra.
Hiker's gentian (*Gentianopsis simplex*)	Fens, meadows, and seeps, usually in areas of crystalline parent material, in the montane and subalpine zones.
Hutchinsia (*Hutchinsia procumbens*)	Vernally moist, alkaline soil of sagebrush steppe in the valley to lower montane zones.
Coville's rush (*Juncus covillei* var. *covillei*)	Open, moist to wet, sandy or gravelly soils along valley rivers.
Large-fruited kobresia (*Kobresia macrocarpa*)	Moist tundra, solifluction* slopes, and gravelly lake shores in the alpine zone.
Island koenigia (*Koenigia islandica*)	Wet, open, gravelly soil in seepage areas in the alpine zone.
Lesica's bladderpod (*Lesquerella lesicii*)	Gravelly, limestone-derived soil of open ridges and slopes among Douglas-fir and mountain mahogany woodlands in the montane zone.
Nuttall's desert parsley (*Lomatium nuttallii*)	Dry, rocky slopes of open pine woodland in the plains.
Desert dandelion (*Malacothrix torreyi*)	Dry, sandy sagebrush steppe in the valley and foothill zones.
Bractless mentzelia (*Mentzelia nuda*)	Sandy or gravelly soil of open hills and roadsides on the plains of eastern Montana
Nama (*Nama densum*)	Sandy soil of sagebrush desert in the valleys.
Blue toadflax (*Nuttallanthus texanus*)	Open, sandy or acid shale soils of grasslands and woodlands on the plains of eastern Montana.
Alpine poppy (*Papaver kluanensis*)	Open, rocky slopes with delayed snowmelt in the alpine zone.
Large flowered beardtongue (*Penstemon grandiflorus*)	Sandy soils of valley plains.
Double bladderpod (*Physaria brassicoides*)	Stony or sandy soil of open grassland slopes on the plains in southeastern Montana.
Woolly twinpod (*Physaria didymocarpa* var. *lanata*)	Sandy, often calcareous soil of open grassland or shrubland slopes in the plains.
Slender-branched popcorn-flower (*Plagiobothrys leptocladus*)	Dry mud on the shores of ponds in plains and foothills.

TABLE VEG-6
STATE OF MONTANA CRITICALLY IMPERILED (S1) PLANT SPECIES WITH POTENTIAL HABITAT IN THE CBNG PLANNING AREA

Common Name (Scientific Name)	Habitat
Short-leaved bluegrass (*Poa curta*)	Sparsely vegetated soil of Douglas-fir forest floor in the montane zone.
Low arctic cinquefoil (*Potentilla hyparctica*)	Moist turf in the alpine zone.
Platte cinquefoil (*Potentilla plattensis*)	Grasslands and sagebrush steppe in the valley and montane zones in south-central Montana.
One-flowered cinquefoil (*Potentilla uniflora*)	Open, gravelly slopes and ridgetops in the alpine zone.
Bur oak (*Quercus macrocarpa*)	Low, shale-derived hills on the plains.
Arctic buttercup (*Ranunculus gelidus*)	Moist, open soil on tundra and talus slopes in the alpine zone.
Persistent-sepal yellow-cress (*Rorippa calycina*)	Riverbanks and shorelines in the valleys on the plains on the Missouri and Yellowstone Rivers.
Barratt's willow (*Salix barrattiana*)	Cold, moist soil in the alpine zone.
Yellow marsh saxifrage (*Saxifraga hirculus*)	Wet, organic soil of fen in the alpine zone.
Clasping groundsel (*Senecio amplectens*)	Stony, open soil and talus of slopes in or near the alpine zone.
Shoshonea (*Shoshonea pulvinata*)	Open, exposed limestone outcrops, ridgetops, and canyon rims, in thin rocky soils.
Prairie aster (*Solidago ptarmicoides*)	Open, dry grasslands, often on sandy soil or limestone on the plains of eastern Montana.
Few-flowered goldenrod (*Solidago sparsiflora*)	Sandy soil of grasslands or open woodlands on the plains.
Slender wedgegrass (*Sphenopholis intermedia*)	Wet areas in the valleys or foothills.
Small dropseed (*Sporobolus neglectus*)	Natural and disturbed grasslands.
Fleshy stitchwort (*Stellaria crassifolia*)	Moist or wet meadows, often along streams, in the foothills to alpine zones.
Letterman's needlegrass (*Stipa lettermanii*)	Limestone talus and dry fescue grassland in the valley and foothill zones in southern Montana.
Poison suckleya (*Suckleya suckleyana*)	Playas and disturbed alkaline soils on the plains.
Nannyberry (*Viburnum lentago*)	Openings in riparian forests on the plains.

S1: At high risk because of extremely limited and/or rapidly declining numbers, range, and/or habitat, thus making it highly vulnerable to extirpation in the state.

TABLE VEG-7
STATE OF MONTANA NOXIOUS WEEDS

Common Name	Scientific Name	Category
Hoary cress or White top	*Cardaria draba*	1
Diffuse knapweed	*Centaurea diffusa*	1
Spotted knapweed	*Centaurea maculosa*	1
Russian knapweed	*Centaurea repens*	1
Yellow starthistle	*Centaurea solstitialis*	3
Rush skeletonweed	*Chondrilla juncea*	3
Oxeye daisy	*Chrysanthemum leucanthemum*	1
Canada thistle	*Cirsium arvense*	1
Field bindweed	*Convolvulus arvensis*	1
Common crupina	*Crupina vulgaris*	3
Houndstongue	*Cynoglossum officinale*	1
Leafy spurge	*Euphorbia esula*	1
Orange hawkweed	*Hieracium aurantiacum*	2
Yellow-devil hawkweed	*Hieracium floribundum*	2
Kingdevil hawkweed	*Hieracium piloselloides*	2
Meadow hawkweed	*Hieracium pratense*	2
Common St. Johnswort	*Hypericum perforatum*	1
Yellowflag iris	*Iris pseudacorus*	3
Dyer's woad	*Isatis tinctoria*	2
Perennial pepperweed	*Lepidium latifolium*	2
Dalmatian toadflax	*Linaria dalmatica*	1
Yellow toadflax	*Linaria vulgaris*	1
Purple loosestrife	*Lythrum salicaria*	2
Wandlike loosestrife	*Lythrum virgatum*	2
Eurasian watermilfoil	*Myriophyllum spicatum*	3
Sulfur cinquefoil	*Potentilla recta*	1
Tall buttercup	*Ranunculus acris*	2
Tansy ragwort	*Senecio jacobaea*	2
Tamarisk (Saltcedar)	*Tamarix spp.*	2
Common tansy	*Tanacetum vulgare*	1

Source: The University of Montana – Missoula, Invaders Database System, June 2004.
1 = Noxious weed: currently established and generally widespread in many counties.
2 = Noxious weed: recently introduced and rapidly spreading.
3 = Noxious weeds: not detected in the state or found only in small, scattered, localized infestations.

TABLE VEG-8
PLANT SPECIES OF CONCERN IN THE PLANNING AREA

			Additional Information		
Common Name	**Scientific Name**	**Known to Occur in the 13 Counties**	**MT**	**BLM**	**USFS**
Musk-root	*Adoxa moschatellina*	Carbon and Stillwater	S2	S	S
Lead plant	*Amorpha canescens*	Carter and Rosebud	SH	S	
Short-styled columbine	*Aquilegia brevistyla*	Sweet Grass	S2		S
Daggett rock cress	*Arabis demissa var languida*	Carbon	S1	S	
Swamp milkweed	*Asclepias incarnata*	Carbon	S1		
Ovalleaf milkweed	*Asclepias ovalifolia*	Carter	S1		S
Narrowleaf milkweed	*Asclepias stenophylla*	Carter and Rosebud	S1	S	
Sweetwater milkvetch	*Astragalus aretioides*	Big Horn and Carbon	S2	S	
Barr's milkvetch	*Astragalus barrii*	Big Horn, Carter, Powder River, and Rosebud	S2S3	S	S
Geyer's milkvetch	*Astragalus geyeri*	Carbon and Custer	S2	S	
Gray's milkvetch	*Astragalus grayi*	Carbon	S2	S	
Wind River milkvetch	*Astragalus oreganus*	Carbon	S1	S	
Obscure evening-primrose	*Camissonia andina*	Carbon	S2	S	
Small camissonia	*Camissonia parvula*	Carbon	S1	S	
Pregnant sedge	*Carex gravida* var. *gravida*	Big Horn, Powder River, and Rosebud	S1		
Toothed Scandinavian sedge	*Carex norvegica* ssp. *inserrulata*	Carbon and Stillwater	S1		
Birchleaf mountain-mahogany	*Cercocarpus montanus* var. *glaber*	Treasure	S1S2		
Smooth goosefoot	*Chenopodium subglabrum*	Carter, Custer, and Powder River	S1		
Yellow bee plant	*Cleome lutea*	Big Horn and Carbon	S1	S	

TABLE VEG-8
PLANT SPECIES OF CONCERN IN THE PLANNING AREA

Common Name	Scientific Name	Known to Occur in the 13 Counties	Additional Information		
			MT	BLM	USFS
Miner's candle	*Cryptantha scoparia*	Carbon	S1	S	
Schweinitz' flatsedge	*Cyperus schweinitzii*	Carter, Custer, and Powder River	S2	S	
Small yellow lady's-slipper	*Cypripedium parviflorum*	Stillwater and Sweet Grass	S2S3	S	S
Nine-anther dalea	*Dalea enneandra*	Custer	S1		
Silky prairie clover	*Dalea villosa* var. *villosa*	Carter	S1		
Scribner's panic grass	*Dichanthelium oligosanthes* var. *scribnerianum*	Powder River	S1	S	
White arctic draba	*Draba fladnizensis*	Carbon and Stillwater	S1		
Porsild's draba	*Draba porsildii*	Carbon	S1		
Entire-leaved avens	*Dryas integifolia*	Golden Valley	S1		
Beaked spikerush	*Eleocharis rostellata*	Carbon and Sweet Grass	S2		S
Long sheath waterweed	*Elodea longivaginata*	Stillwater	S2	S	
Giant helleborine	*Epipactis gigantea*	Carbon	S2		S
Eaton's daisy	*Erigeron eatonii* ssp. *eatonii*	Sweet Grass	S1		
Beautiful fleabane	*Erigeron formosissimus* var. *viscidus*	Carbon	S1		
Smooth buckwheat	*Eriogonum salsuginosum*	Carbon	S1	S	
Visher's buckwheat	*Eriogonum visheri*	Carter	S1	S	
Sheathed cotton-grass	*Eriophorum calllitrix*	Carbon	S1		
Hiker's gentian	*Gentianopsis simplex*	Carbon	S1		S

TABLE VEG-8
PLANT SPECIES OF CONCERN IN THE PLANNING AREA

Common Name	Scientific Name	Known to Occur in the 13 Counties	Additional Information		
			MT	BLM	USFS
Northern rattlesnake-plantain	*Goodyera repens*	Wheatland	S2S3		S
Bractless hedge-hyssop	*Gratiola ebracteata*	Yellowstone	S1		
Spiny hopsage	*Grayia spinosa*	Carbon	S2	S	
Beartooth large-flowered goldenweed	*Haplopappus carthamoides* var. *subsquarrosus*	Carbon	S2	S	S
Hutchinsia	*Hutchinsia procumbens*	Carbon	S1	S	
Coville's rush	*Juncus covillei* var. *covillei*	Sweet Grass	S1		
Large-fruited kobresia	*Kobresia macrocarpa*	Carbon	S1		
Island koenigia	*Koenigia islandica*	Carbon	S1		
Leptodactylon	*Leptodactylon caespitosum*	Carbon	S2	S	
Lesica's bladderpod	*Lesquerella lesicii*	Carbon	S1	S	
Nuttall's desert parsley	*Lomatium nuttallii*	Big Horn and Rosebud	S1	S	
Desert dandelion	*Malacothrix torreyi*	Carbon	S1	S	
White-bract stickleaf	*Mentzelia montana*	Custer	SH	S	
Bractless mentzelia	*Mentzelia nuda*	Custer, Powder River, and Rosebud	S1	S	
Dwarf mentzelia	*Mentzelia pumila*	Carbon	S2	S	
Nama	*Nama densum*	Carbon	S1	S	
Blue toadflax	*Nuttallanthus texanus*	Carter	S1		
Alpine poppy	*Papaver kluanensis*	Carbon and Sweet Grass	S1		
Narrowleaf penstemon	*Penstemon angustifolius*	Carter	S2	S	
Large flowered beardtongue	*Penstemon grandiflorus*	Custer	S1		
Plains phlox	*Phlox andicola*	Carter, Powder River, and Rosebud	S2	S	

TABLE VEG-8
PLANT SPECIES OF CONCERN IN THE PLANNING AREA

Common Name	Scientific Name	Known to Occur in the 13 Counties	Additional Information		
			MT	BLM	USFS
Double bladderpod	*Physaria brassicoides*	Carter and Powder River	S2	S	
Woolly twinpod	*Physaria didymocarpa* var. *lanata*	Big Horn and Rosebud	S1	S	
Slender-branched popcorn-flower	*Plagiobothrys leptocladus*	Custer	S1	S	
Short-leaved bluegrass	*Poa curta*	Carbon	S1	S	
Low arctic cinquefoil	*Potentilla hyparctica*	Carbon	S1		
Platte cinquefoil	*Potentilla plattensis*	Carbon	S1	S	
One-flowered cinquefoil	*Potentilla uniflora*	Carbon	S1		
Mealy primrose	*Primula incana*	Carbon	S2	S	S
Bur oak	*Quercus macrocarpa*	Carter	S1	S	
Arctic buttercup	*Ranunculus gelidus*	Stillwater	S1		
Persistent-sepal yellow-cress	*Rorippa calycina*	Big Horn, Custer, Rosebud, Treasure, and Yellowstone	S1	S	
Barratt's willow	*Salix barrattiana*	Carbon	S1		S
Yellow marsh saxifrage	*Saxifraga hirculus*	Carbon	S1		
Clasping groundsel	*Senecio amplectens* var. *holmii*	Carbon	S1		
Shoshonea	*Shoshonea pulvinata*	Carbon	S1	S	S
Prairie aster	*Solidago ptarmicoides*	Carter	S1		
Few-flowered goldenrod	*Solidago sparsiflora*	Stillwater	S1	S	
Slender wedgegrass	*Sphenopholis intermedia*	Big Horn	S1		
Small dropseed	*Sporobolus neglectus*	Wheatland	S1		
Fleshy stitchwort	*Stellaria crassifolia*	Carbon	S1		

TABLE VEG-8
PLANT SPECIES OF CONCERN IN THE PLANNING AREA

Common Name	Scientific Name	Known to Occur in the 13 Counties	Additional Information		
			MT	BLM	USFS
Letterman's needlegrass	*Stipa lettermanii*	Big Horn and Carbon	S1		
Poison suckleya	*Suckleya suckleyana*	Musselshell	S1		
Wyoming sullivantia	*Sullivantia hapemanii*	Big Horn and Carbon	S2	S	
Small-flowered pennycress	*Thlaspi parviflorum*	Carbon	S2	S	
Nannyberry	*Viburnum lentago*	Big Horn	S1		

S = sensitive
S1: At high risk because of extremely limited and/or rapidly declining numbers, range and/or habitat, making it highly vulnerable to extirpation in the state.
S2: At risk because of very limited and/or declining numbers, range and/or habitat, making it vulnerable to extirpation in the state.
S3: At risk because of very limited and/or declining numbers, range and/or habitat, making it vulnerable to extirpation in the state.
SH: Possibly extinct - species known from only historical occurrences, but may nevertheless still be extant; further searching is needed.

WILDLIFE APPENDIX

WILDLIFE APPENDIX

This appendix contains a series of tables cited in Chapter 3 of the SEIS Wildlife section. Following those tables is the CBNG Programmatic Wildlife Monitoring and Protection Plan developed by the BLM for the Statewide Document and updated for the SEIS.

This appendix also contains a copy of the Biological Assessment as prepared for the U.S. Fish and Wildlife Service (USFWS). The Biological Assessment has as attachments the BLM's letter formally requesting a list of threatened and endangered species from the USFWS and initiating consultation for the SEIS process under Section 7 of the Endangered Species Act of 1973. The letter from USFWS responding to the BLM's request is included as well as a memorandum from USFWS explaining that concurrence from them is not required when a no effects determination is made by the BLM.

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TABLE WIL-1
WILDLIFE SPECIES OF CONCERN

Common Name	Scientific Name	Occurrence in CBNG Planning Area (by county)[1]	Additional Information			
			MT	BLM	USFS	Suitable Habitat
Mammals						
Pallid bat	*Antrozous pallidus*	All except Wheatland and Sweet Grass	S2	S	S	Arid areas with rocky outcrops, dry forests, riparian forests, and ponderosa pine low slope forests in south-central Montana (UM).
Townsend's big-eared bat	*Corynorhinus (Plecotus) townsendii*	All	S2	S	S	Arid scrub and pine forest, uses caves, snags, old mines and buildings the Custer and Gallatin National Forests (NM).
Spotted bat	*Euderma maculatum*	Golden Valley, Musselshell, Yellowstone, Big Horn, Carbon	S2	S	S	Various habitats in south-central Montana from open coniferous to pastureland.
Northern myotis	*Myotis septentrionalis*	Not known to occur in CBNG planning area, but distribution not well-known.	S2S3	S		Mixed and coniferous forests with small woodland pools and streams, in clearings (NM). Lower Missouri River.
Long-legged myotis[2]	*Myotis volans*	All	S4	S		Forests and woodlands.
Long-eared myotis[2]	*Myotis evotis*	All	S4	S		Forests and woodlands. Also, rocky areas.
Fringed myotis[2]	*Myotis thysanodes*	Wheatland	S3	S		Shrublands, sagebrush-grassland, pine and Douglas-fir forests and woodlands and adjacent riparian forests.
White-tailed prairie dog	*Cynomys leucurus*	Carbon	S1	S	S	Grasslands and plains.
Black-tailed prairie dog	*Cynomys ludovicianus*	All	S3	S	S	Short-grass and mixed-grass prairie in the east of the 110th meridian Fort Belknap Reservation, and Crow Reservation.
North American wolverine	*Gulo gulo luscus*	Wheatland, Sweet Grass, Stillwater, Carbon	S3	S	S	Mature and old-growth fir, pine and larch forests, alpine shrub, talus, and riparian cottonwoods.
Fisher	*Martes pennanti*	Sweet Grass, Stillwater, Carbon	S3	S	S	Forests with mixed habitat, several structural classes, edges and riparian areas.

TABLE WIL-1
WILDLIFE SPECIES OF CONCERN

Common Name	Scientific Name	Occurrence in CBNG Planning Area (by county)[1]	Additional Information			
			MT	BLM	USFS	Suitable Habitat
Northern bog lemming	*Synaptomys borealis*	Not known to occur in CBNG planning area, but distribution not well-known.	S2		S	Damp pastures, tundra, cool bogs, peatlands, marshes, or moist meadows.
Herptiles						
Boreal/Western toad	*Bufo boreas*	Wheatland, Sweet Grass, Stillwater, Carbon	S2	S	S	Breeding ponds, summer range, and overwinter refugia within lodgepole pine or spruce-fir forests.
Great Plains toad[2]	*Bufo cognatus*	All except Carbon	S2	S		Coulees and sagebrush-grasslands. Breeds in glacial potholes, stock reservoirs, and irrigation ditches.
Plains spadefoot[2]	*Spea bombifrons*	All	S3	S		Sagebrush and grasslands with loose soils, usually near temporary or permanent water.
Wood frog	*Rana sylvatica*	None known in CBNG planning area, but distribution not well-known.		S		Temporary ponds, lakes, and streams with adjacent forests or brush with damp litter.
Northern leopard frog	*Rana pipiens*	All	S3		S	Streams, ponds, lakes, wet prairies, and other bodies of water, frequently moving into grassy, herbaceous fields or forest borders some distance from permanent water.
Snapping turtle	*Chelydra serpentiana*	All except Wheatland, Sweet Grass, Golden Valley, and Musselshell	S3	S		Shallow, mud-bottomed backwaters and ponds with lush aquatic vegetation.
Spiny softshell	*Trionyx spiniferus*	Custer, Rosebud, Big Horn, Treasure, Yellowstone, Musselshell, Golden Valley, Wheatland (Yellowstone River and some tributaries; Musselshell River)	S3	S		Rivers, backwaters, lakes, and ponds with sand or mud areas for digging nests. Missouri and Yellowstone Rivers
Short-horned lizard[2]	*Phrynosoma hernendesi*	All	S3	S		Short-grass prairie and sagebrush areas, especially south-facing slopes, rocky rims of coulees, and shale outcrops.
Milk snake[2]	*Lampropeltis triangulum*	All except Carter, Sweet Grass, Wheatland, and Golden Valley	S2	S	S	Grasslands, sagebrush, and Ponderosa pine savannah. Also, edges of agricultural fields.

TABLE WIL-1
WILDLIFE SPECIES OF CONCERN

Common Name	Scientific Name	Occurrence in CBNG Planning Area (by county)[1]	Additional Information			
			MT	BLM	USFS	Suitable Habitat
Western hog-nosed snake[2]	*Heterodon nasicus*	All	S2	S	S	Arid areas, farmlands, floodplains, grasslands, and sagebrush with well-drained, sandy soils.
Birds						
Common loon[2]	*Gavia immer*	Wheatland, Golden Valley, Sweet Grass, Stillwater, Carbon, Yellowstone, Big Horn	S2B	S	S	Lakes that are at least 13 acres in size and over 5000 feet in elevation. Also, generally require nursery areas that are sheltered, shallow coves with abundant small fish and insects.
Trumpeter swan	*Cygnus buccinator*	Sweet Grass	S2B	S	S	Shallow freshwater marshes, ponds, lakes, and slow-moving rivers with both submerged and emergent vegetation.
Franklin's gull[2]	*Larus pipixcan*	Rosebud, Yellowstone, Carbon, Stillwater, Sweet Grass, Wheatland, Golden Valley, Musselshell	S3B	S		Large, relatively permanent prairie marsh complexes.
White-faced ibis	*Plegadis chihi*	Golden Valley, Musselshell, Stillwater, Yellowstone, Carbon	S1B	S		Freshwater wetlands (marshes, ponds, swamps) with islands of emergent vegetation.
Black tern[2]	*Chlidonias niger*	Carter, Custer, Musselshell, Yellowstone, Stillwater, Sweet Grass, Golden Valley, Wheatland	S3B	S		Breeds in wetlands, marshes, prairie potholes, and small ponds; also, on islands.
Harlequin duck	*Histrionicus histrionicus*	Carbon, Stillwater, Sweet Grass	S2B	S	S	Summer on mountain streams and rivers, nest on the ground near water's edge or in the hollows of dead trees.
Long-billed curlew	*Numenius americanus*	Wheatland, Golden Valley, Musselshell, Sweet Grass, Stillwater, Yellowstone, Big Horn, Carbon	S2B	S	S	Open grasslands and prairies, often near water.
Willet[2]	*Catoptrophorus semipalmatus*	All except Treasure and Custer	S5B	S		Open, dry areas and sandy flats; usually, near lakes or marshes.
Wilson's phalarope[2]	*Phalaropus tricolor*	All except Treasure	S4B	S		Marshy borders of lakes and ponds. Also, flooded fields in spring.

TABLE WIL-1
WILDLIFE SPECIES OF CONCERN

Common Name	Scientific Name	Occurrence in CBNG Planning Area (by county)[1]	Additional Information			
			MT	BLM	USFS	Suitable Habitat
Golden eagle[2]	*Aquila chrysaetos*	All	S4	S		Nests on cliffs and in large trees. Hunts over grasslands, sagebrush, and open woodlands.
Swainson's hawk	*Buteo swainsoni*	All	S3B	S		Shrub-steppe, prairie with scattered trees, or open woodlands.
Ferruginous hawk	*Buteo regalis*	All	S2B	S		Undisturbed plains or shrub-steppe with relatively unbroken terrain and scattered trees, rocks, or treed creek bottoms.
Northern goshawk	*Accipiter gentilis*	All	S3	S	S	Coniferous, deciduous, and mixed forests with a high density of large, old trees and high overstory canopy.
Burrowing owl	*Athene cunicularia*	Rosebud, Wheatland, Golden Valley, Musselshell, Sweet Grass, Stillwater, Yellowstone, Carbon	S2B	S	S	Burrows made by prairie dogs or badgers in rangeland and prairie areas.
Great gray owl	*Strix nebulosa*	Wheatland, Sweet Grass, Stillwater, Carbon	S3	S		Dense, often moist, forests, with openings for hunting.
Three-toed woodpecker	*Picoides tridactylus*	Wheatland, Sweet Grass, Stillwater, Carbon	S3S4	S		Pine-dominated mature forests and burned areas in early successional stages.
Red-headed woodpecker[2]	*Melanerpes erythrocephalus*	All	S3B	S		Riparian forests along major rivers; also, savannahs and large burns.
Black-backed woodpecker	*Picoides articusi*	Custer, Powder River	S2	S	S	Coniferous forests, especially early post-fire habitat
Sprague's pipit[2]	*Anthus spragueii*	All except Big Horn and Powder River	S2B	S	S	Grasslands.
Pygmy nuthatch[2]	*Sitta pygmaea*	All	S4		S	Primarily Ponderosa pine forests. Also, stands of other pines, Douglas-fir, western larch, and aspen.
Blue-gray gnatcatcher	*Polioptila caerulea*	Carbon	S1B	S	S	Juniper and limber pine in the Pryor Mountains of south-central Montana.

TABLE WIL-1
WILDLIFE SPECIES OF CONCERN

Common Name	Scientific Name	Occurrence in CBNG Planning Area (by county)[1]	Additional Information: MT	BLM	USFS	Suitable Habitat
Sage thrasher[2]	*Oreoscoptes montanus*	All except Carter	S3B	S		Sagebrush; rocky canyons in arid areas.
Loggerhead shrike	*Lanius ludovicianus*	All	S3B	S	*S*	Edge habitat with open country, thinly wooded or scrubby land with clearings, meadows, and aspen stands bordering dense, ungrazed or lightly grazed grassland.
Sage sparrow	*Amphispiza belli*	Not documented within the past 10 years in CBNG planning area, but range not well-known.	S1S3B	S		Sagebrush.
Baird's sparrow	*Ammodramus bairdii*	All except Treasure, Big Horn, and Musselshell	S2B	S	S	Open tall to mixed grass areas with mixture of mostly native prairie grasses and forbs.
Brewer's sparrow[2]	*Spizella breweri*	All	S2B	S		Sagebrush and grasslands.
Le Conte's sparrow[2]	*Ammodramus leconteii*	Yellowstone, Big Horn	S1S2B	S		Wet or irrigated meadows.
Chestnut-collared longspur[2]	*Calcarius ornatus*	All except Treasure and Big Horn	S3B	S		Short-grass prairie/grasslands.
McCown's longspur[2]	*Calcarius mccownii*	All except Big Horn	S2B	S		Grasslands, pastures, and agricultural areas.
Dickcissel	*Spiza americana*	Powder River, Rosebud, Treasure	S1S2B	S		Hayfields, pastures, weedy fallow fields, and the weedy margins of ditches and roadsides
Fish						
Yellowstone Cutthroat Trout	*Oncorhynchus clarki bouvieri*	Western Counties	S2	S	S	Mountain lakes and streams with varying habitat structures and water velocities.
Blue sucker	*Cycleptus elongatus*	Eastern Counties	S2S3	S		Deep water of large rivers and reservoirs with low turbidity and swift current.

TABLE WIL-1
WILDLIFE SPECIES OF CONCERN

Common Name	Scientific Name	Occurrence in CBNG Planning Area (by county)[1]	Additional Information			
			MT	BLM	USFS	Suitable Habitat
Paddlefish	*Polyodon spathula*	Eastern Counties	S1S2	S		Historically found in calm, open waters of large rivers in the Mississippi River drainage as far north as the Missouri River in Montana.
Pearl dace	*Semotilus/Margariscus margarita*	Unknown within the CBNG Planning Area, but documented in the Yellowstone River just downstream of the CBNG Planning Area (Wibaux and Dawson counties)	S2	S		Cool or cold water lakes, bog ponds, creeks, and springs
Sauger	*Sander canadensis*	All Counties	S2	S		Larger turbid rivers and the muddy shallows of lakes and reservoirs.
Sturgeon chub	*Macrhybopsis gilida*	Eastern Counties	S2	S	S	Turbid water with moderate to strong currents.
Northern redbelly dace X Finescale dace[3]	*Phoxinus eos X Phoxinus neogaeus*	Western Counties	S3	S		Boggy lakes, creeks, and ponds, often with cool, dark, tea-colored water.

[1] Represents updated information (relative to the Statewide Document) on known or expected species' occurrence based on FWP species' range maps (Montana Animal Field Guide, http://fwp.state.mt.us/fieldguide).
[2] Classified as state "S1", BLM sensitive, and/or USFS sensitive after completion of the Statewide Document.
[3] Hybrid, always female.
NI = no information.
S = sensitive.
S1= critically imperiled in the state.
S2 = vulnerable to extinction.
S3 = rare or restricted in range.
S4 = uncommon, but not rare; usually widespread.

S5 = common, widespread, and abundant.
B = breeding status of a migratory species (rank refers to the breeding population of the species in Montana).

TABLE WIL-2
AQUATIC RESOURCES CHARACTERISTICS OF MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS AND POWDER RIVER RESOURCE MANAGEMENT PLAN AREAS AND IN PARK, GALLATIN, AND BLAINE COUNTIES[1]

Location and Drainage	Length (miles)[2]	Aesthetics[3]	Fisheries Management[4]	Fisheries Resource Value[5]	Number of Fish Species Present	Dewatering Problem Identified?[6]
Billings Resource Management Area						
Yellowstone River West of Billings (River Mile [RM] 360.2 – 554.1)	194	National renown, clean stream and natural setting, stream and area fair			23	
Downstream Section (RM 360.2 – 472.9)	113		Warm/cool water	Outstanding, high, substantial	22	Periodic
Upstream Section (RM 472.9 – 554.1)	81		Trout	Outstanding	14	No
Boulder River (RM 0.0 – 65.2)	65	Natural beauty, pristine	Trout	Outstanding, high, substantial	9	Chronic
Stillwater River (RM 0.0 – 60.0)	60	Natural beauty, clean stream and natural setting	Trout	Outstanding, high, substantial	9	No
Clarks Fork of the Yellowstone						
Downstream Section (RM 0.0 – 41.7)	42	Stream and area fair	Trout	Substantial	18	Periodic
Upstream Section (RM 41.7 – 70.9)	29	Clean stream and natural setting	Trout	Substantial	15	Chronic
Yellowstone River East of Billings (RM 294.5 – 360.2)	66	Clean stream and natural setting, stream and area fair	Warm/cool water and non-trout	High	28	Periodic
Bighorn River						
Downstream Section (RM 0.0 – 42.3)	42	Stream and area fair	Trout	High	30	Periodic
Little Bighorn River (RM 0.0 – 118.5)	119	Natural beauty, clean stream and natural setting	Trout	Moderate	15	No
Upstream Section (RM 42.3 – 84.7)	42	National renown	Trout	Outstanding	20	No
Musselshell River (RM 107.9 – 341.9)	234	Clean stream and natural setting, stream and area fair	Trout	High, substantial	30	Chronic, Periodic
Careless Creek (RM 0.0 – 55.6)	56	Clean stream and natural setting, stream and area fair	Trout	Substantial, moderate, limited	14	Chronic

TABLE WIL-2
AQUATIC RESOURCES CHARACTERISTICS OF MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS AND POWDER RIVER RESOURCE MANAGEMENT PLAN AREAS AND IN PARK, GALLATIN, AND BLAINE COUNTIES[1]

Location and Drainage	Length (miles)[2]	Aesthetics[3]	Fisheries Management[4]	Fisheries Resource Value[5]	Number of Fish Species Present	Dewatering Problem Identified?[6]
Powder River Resource Management Area						
Yellowstone River (RM 147.0 – 294.5)	140	Clean stream and natural setting	Non-trout	Outstanding, High	47	No
Rosebud Creek (RM 0.0 – 207.6)	208	Stream and area fair	Undesignated	High, substantial	20	No
Tongue River						
Downstream Section (RM 0.0 – 93.3)	93	Clean stream and natural setting, stream and area fair	Trout	High, substantial	37	Chronic, Periodic
Pumpkin Creek (RM 0.0 -171.1)	171	Clean stream and natural setting, stream and area fair	Non-trout	Substantial, moderate, limited	23	No
Upstream Section (RM 93.3 – 217.5)	124	Clean stream and natural setting	Trout	High	30	Periodic
Otter Creek (RM 0.0 – 103.3)	103	Stream and area fair	Undesignated	Substantial, moderate	24	No
Hanging Woman Creek (RM 0.0 – 47.9)	48	Clean stream and natural setting	Undesignated	Substantial, moderate	26	No
Powder River						
Downstream Section (RM 18.4 – 144.5)	126	Low	Non-trout	High	27	Chronic
Mizpah Creek (RM 0.0 – 149.7)	150	Low, clean stream and natural setting	Non-trout	Moderate, limited	19	No
Little Powder River (RM 0.0 – 71.6)	72	Stream and area fair	Non-trout	Substantial	20	No
Upstream Section (RM 144.5 – 220.2)	76	Low, natural and pristine beauty	Non-trout	High	24	Chronic
Little Missouri River (RM 422.4 – 528.4)	103	Clean stream and natural setting	Non-trout	High	19	No

[1]Information derived from the Montana Natural Resource Information System on the Internet at http://nris.state.mt.us/wis/nrisf.html (downloaded September 29, 2005). Multiple values for a resource characteristic indicate river reach differences within a given drainage.

[2]Estimated length of drainage within the Resource Management Area or county (based on river miles from NRIS 2005).

[3]Aesthetics ratings in descending order are: national renown; natural and pristine beauty with some development; clean stream and natural setting; stream and area fair; and low (NRIS 2001).

[4]Categories of fisheries management are: trout; non-trout; warm/cool water; and undesignated.

[5]Fisheries resource values ratings in descending order are: outstanding; high; substantial; moderate; and limited.

[6]Dewatering indicates a reduction in streamflow beyond the point where stream habitat is adequate for fish and usually occurs during the irrigation season (July through September). Periodic dewatering indicates a significant problem in drought or water-short years, and chronic dewatering indicates a significant problem in virtually all years.

TABLE WIL-3
COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES ND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS RESOURCE MANAGEMENT PLAN AREA[1]

					Clarks Fork of the Yellowstone			Bighorn River				
Common Name	Scientific Name	Yellowstone River West of Billings	Boulder River	Stillwater River	Downstream Section	Upstream Section	Yellowstone River East of Billings	Downstream Section	Upstream Section	Little Bighorn River	Musselshell River	Careless Creek
Goldeye	*Hiodon alasoides*	A, C, R			A	U	A	A	A, C, R		C	
Lake chub	*Couesius plumbeus*				R	C	R	R			R	A
Common carp[2]	*Cyprinus carpio*	C, R			R	U	C	C	C	U	C	U
Western silvery/plains minnow	*Hybognathus argyritis/placitus*				R	R		C	R		A, C, R	
Brassy minnow	*Hybognathus hankinsoni*									U	R	U
Emerald shiner	*Notropis atherinoides*	C, R				R	C	R	R		A, C, R	
Sand shiner	*Notropis stramineus*										A, R	
Northern redbelly/finescale dace	*Phoxinus eos/neogaeus*										R	R
Northern redbelly dace	*Phoxinus eos*										R	R
Fathead minnow	*Pimephales promelas*							R		U	C, R	R
Flathead chub	*Platygobio gracilis*	C			U		A, C	C		U	C	A
Longnose dace	*Rhinichthys cataractae*	C, R	C	A, C, R	C	C	A	C	A, C	U	I	A
River carpsucker	*Carpiodes carpio*	R			C		C	C	R	U	I	U
Longnose sucker	*Catostomus catostomus*	A, C	A	C, R	A, C	C	C	A	A	C	I	C
White sucker	*Catostomus commersoni*	C		A, R	A	A	C	A	A	C	A, C, U	A, C
Mountain sucker	*Catostomus platyrhynchus*	A, U, R	C	C, R	C	A	A	C	C	U	C	C
Smallmouth buffalo	*Ictiobus bubalus*	R					R	R			R	
Bigmouth buffalo	*Ictiobus cyprinellus*						R	R				

TABLE WIL-3
COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES
ND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS RESOURCE MANAGEMENT PLAN AREA[1]

Common Name	Scientific Name	Yellowstone River West of Billings	Boulder River	Stillwater River	Clarks Fork of the Yellowstone		Yellowstone River East of Billings	Bighorn River		Little Bighorn River	Musselshell River	Careless Creek
					Downstream Section	Upstream Section		Downstream Section	Upstream Section			
Brook stickleback	*Culaea inconstans*	U										
Shorthead redhorse	*Moxostoma macrolepidotum*	A, C, R			R		A	C	C, R	U	I	C
Black bullhead[2]	*Ameiurus melas*	R						R			R	
Yellow bullhead[2]	*Ameiurus natalis*						U					
Channel catfish	*Ictalurus punctatus*	C, R			R		A	C	R	C	A, C, R	
Stonecat	*Noturus flavus*	R			C		C	R			R	
Northern pike[2]	*Esox lucius*						R	I	R		R	
Yellowstone cutthroat trout	*Oncorhynchus clarki bouvieri*	C, R	R	C	I	C						
Rainbow trout[2]	*Oncorhynchus mykiss*	C	C, R	A, C, R	R	R	U	C	A, C	C	I	
Mountain whitefish	*Prosopium williamsoni*	A, R	A	A, C, R	C	A	U	R	C	C	C, R	
Brown trout[2]	*Salmo trutta*	C, R	A	A, C, R	R	R	U	R	A, C	C	C, R	
Brook trout[2]	*Salvelinus fontinalis*	R	A, R	C, R								C
Arctic grayling	*Thymallus arcticus*					R						
Burbot	*Lota lota*	C, R			C	U	C	C	C, R		I	
Plains killifish	*Fundulus zebrinus*							R				
Mottled sculpin	*Cottus bairdi*	A, C, U	C		R						A, C	
Green sunfish[2]	*Lepomis cyanellus*							R	R		R, I	
Smallmouth bass[2]	*Micropterus dolomieu*						C	R	R	C	C, R	

TABLE WIL-3
COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES ND REPRESENTATIVE TRIBUTARIES IN THE BILLINGS RESOURCE MANAGEMENT PLAN AREA[1]

Common Name	Scientific Name	Yellowstone River West of Billings	Boulder River	Stillwater River	Clarks Fork of the Yellowstone		Yellowstone River East of Billings	Bighorn River		Little Bighorn River	Musselshell River	Careless Creek
					Downstream Section	Upstream Section		Downstream Section	Upstream Section			
Largemouth bass[2]	*Micropterus salmoides*						R				I	
Black crappie[2]	*Pomoxis nigromaculatus*						I	I			I	
Yellow perch[2]	*Perca flavescens*						R	R			I	
Sauger	*Stizostedion canadense*	R			I		R	R	R		C, R	
Walleye[2]	*Stizostedion vitreum*						R	R	R		R	
Freshwater drum	*Aplodinotus grunniens*						R	R			R	

[1]Information derived from the Montana Natural Resource Information System on the Internet at http://nris.state.mt.us/wis/nrisl.html (downloaded September 29, 2005). Multiple values for relative abundance indicate variation among river reaches and/or study results within a given drainage. Relative abundance: A = abundant; C = common; U = uncommon; R = rare; I = incidental; P = present.

[2]Indicates species is not native.

TABLE WIL-4
COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE POWDER RIVER RESOURCE MANAGEMENT PLAN AREA[1]

				Tongue River			Powder River			
Common Name	Scientific Name	Yellowstone River	Rosebud Creek	Downstream Section	Upstream Section	Pumpkin Creek	Downstream Section	Upstream Section	Little Powder River	Little Missouri River
Pallid sturgeon	*Scaphirhynchus albus*	R					U			
Shovelnose sturgeon	*Scaphirhynchus platorynchus*	A		A			A	A		
Paddlefish	*Polyodon spathula*	C		R						
Goldeye	*Hiodon alasoides*	A	R	A		R	C	C	C	R
Lake chub	*Couesius plumbeus*	R	R			C, R	U	U		C
Common carp[2]	*Cyprinus carpio*	C	C	U	C	C, R	R	R	R	R
Western silvery minnow	*Hybognathus argyritis*	C		U		U		U	U	
Western silvery/plains minnow	*Hybognathus argyritis/placitus*	U		U		C	A	A	A	I
Western plains minnow	*Hybognathus placitus*	R		U		U	U	C	R	C
Brassy minnow	*Hybognathus hankinsoni*	R	I	U		C	R	R	U	
Sturgeon chub	*Macrhybopsis gelida*	U, R		R			C	C		
Spottail shiner	*Notropis hudsonius*	U			U					
Golden shiner[2]	*Notemigonus crysoleucas*	U								C
Emerald shiner	*Notropis atherinoides*	C		U	U					
Sand shiner	*Notropis stramineus*	R		U		C	R	R	A	A
Northern redbelley/finescale dace	*Phoxinus eos/neogaeus*	R								
Fathead minnow	*Pimephales promelas*	C	R	U		A, C	U		A	C
Flathead chub	*Platygobio gracilis*	A	A	A	A	C, R	A	A	R	A
Longnose dace	*Rhinichthys cataractae*	R	C	U	C, R	R	C	C, R	R	C

TABLE WIL-4
COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE POWDER RIVER RESOURCE MANAGEMENT PLAN AREA[1]

				Tongue River			Powder River			
Common Name	Scientific Name	Yellowstone River	Rosebud Creek	Downstream Section	Upstream Section	Pumpkin Creek	Downstream Section	Upstream Section	Little Powder River	Little Missouri River
Creek chub	*Semotilus atromaculatus*	R		U	R, U	U	R	R	R	C
River carpsucker	*Carpiodes carpio*	C	R	C	C	R	R	R	C	R
Longnose sucker	*Catostomus catostomus*	C	R	C	A, C					
White sucker	*Catostomus commersoni*	C	C	C	A	C, R	U		R	C
Mountain sucker	*Catostomus platyrhynchus*	A, R	R	R	C	R				
Blue sucker	*Cycleptus elongatus*	R		R						
Smallmouth buffalo	*Ictiobus bubalus*	C, R		R	C					
Bigmouth buffalo	*Ictiobus cyprinellus*	C, R		R						
Shorthead redhorse	*Moxostoma macrolepidotum*	A	A	A	A, C	C, R	R	C, R	C	A
Black bullhead[2]	*Ameiurus melas*		R	R	R	R			U	R
Yellow bullhead[2]	*Ameiurus natalis*	R		R	R					
Channel catfish	*Ictalurus punctatus*	A	C	A	C	C, R	C	C, R	C	C
Stonecat	*Noturus flavus*	C	R	C	C	R	R	R	R	U
Northern pike[2]	*Esox lucius*	R	C	U	R					
Rainbow trout[2]	*Oncorhynchus mykiss*	R			R		R	R		
Mountain whitefish	*Prosopium williamsoni*	R	I		R					
Brown trout[2]	*Salmo trutta*	R			R		R	R		
Brook trout[2]	*Salvelinus fontinalis*		R				R	R		
Burbot	*Lota lota*	C	C	R			R	R		
Plains killifish	*Fundulus zebrinus*						U			R

TABLE WIL-4
COMMON AND SCIENTIFIC NAMES AND RELATIVE ABUNDANCE OF FISH SPECIES PRESENT IN MAJOR DRAINAGES AND REPRESENTATIVE TRIBUTARIES IN THE POWDER RIVER RESOURCE MANAGEMENT PLAN AREA[1]

				Tongue River			Powder River			
Common Name	Scientific Name	Yellowstone River	Rosebud Creek	Downstream Section	Upstream Section	Pumpkin Creek	Downstream Section	Upstream Section	Little Powder River	Little Missouri River
Rock bass[2]	*Ambloplites rupestris*	R		R	C					
Green sunfish[2]	*Lepomis cyanellus*	R			R	R	R	R	R	R
Pumpkinseed[2]	*Lepomis gibbosus*	R, I		R	R	R			U	
Goldfish	*Carassius auratus*				R					
Smallmouth bass[2]	*Micropterus dolomieu*	C, R		C, R	C					
Largemouth bass[2]	*Micropterus salmoides*	R								
White crappie[2]	*Pomoxis annularis*	R	R	U	R	R				
Black crappie[2]	*Pomoxis nigromaculatus*	R, I		U	R					
Yellow perch[2]	*Perca flavescens*	R		I	R					
Sauger	*Stizostedion canadense*	C, R	C	C	C	R	A	A, R		R
Walleye[2]	*Stizostedion vitreum*	C, R	R	C, R	C		R	R		
Freshwater drum	*Aplodinotus grunniens*	R		U						

[1]Information derived from the Montana Natural Resource Information System on the Internet at http://nris.state.mt.us/wis/nris1.html (downloaded September 29, 2005). Multiple values for relative abundance indicate variation among river reaches and/or study results within a given drainage. Relative abundance: A = abundant; C = common; U = uncommon; R = rare; I = incidental; P = present.

[2]Indicates species is not native.

CBNG Programmatic Wildlife Monitoring and Protection Plan
for the
Statewide Final Oil and Gas Environmental Impact Statement
and
Proposed Amendment of the Powder River and Billings Resource Management Plans

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INTRODUCTION

This Wildlife Monitoring and Protection Plan (WMPP) was prepared in conjunction with the Statewide Oil and Gas Draft Environmental Impact Statement (DEIS) (BLM 2001 Montana DEIS) and Amendment of the Powder River and Billings Resource Management Plans (RMPs). The DEIS and Amendment addresses future exploration for and development of Bureau of Land Management (BLM) and state of Montana (state) managed coal bed natural gas (CBNG) resources and conventional oil and gas resources. The planning area excludes those lands administered by the Forest Service, the Crow, Northern Cheyenne, and other Indian lands. The WMPP will be implemented on federal lands, including split estate, in cooperation with state agencies, federal agencies, tribal representatives, Operators, and landowners. If owners and managers of state and private mineral development are willing to incorporate this guidance into management of their CBNG activities, they may become a partner by entering into a Cooperative Agreement.

A variety of planning issues related to wildlife were identified during preparation of the DEIS. The goal of the WMPP is to avoid or minimize impacts to wildlife and serve as a communication tool to foster cooperative relationships among the CBNG and conventional Oil and Gas industry (i.e., Operators), resource management agencies, landowners and adjacent Tribal Governments. Because this plan addresses a large geographic area composed of diverse wildlife habitats and unique situations, it must be programmatic in nature. However, the need to provide management recommendations and guidance to conserve species and habitats remains. Regional or site specific monitoring and protection plans which follow the guidance provided in this programmatic document will be required as part of each CBNG Project Plan. Implementation of this plan during the course of project development and operations should promote wildlife conservation and allow land managers and project personnel to maintain wildlife populations and productivity levels simultaneously with the development of natural oil and gas resources.

PLAN PURPOSE

Oil and gas leasing decisions and lease stipulations were previously analyzed in the Bureau of Land Management (BLM) 1992 *Final Oil and Gas RMP/EIS Amendment* (BLM 1992). Wildlife stipulations attached to leases offer protective measures: 1) for certain species, 2) during a particular time period, or 3) within a specific area. These stipulations may not address other concerns related to special status species or water/habitat related issues caused by direct and indirect impacts from CBNG exploration and development. Because it is purely speculative to predict how all wildlife will react or how development will proceed, it is difficult to develop prescriptive mitigation standards across the entire planning area. Even though BLM has some adaptive management strategies in place (e.g., conditions of approval and compliance inspections), these mechanisms do not give us the information necessary to understand cause and effect relationships across a landscape. Therefore, the purpose of this Plan is to acquire baseline wildlife information, monitor populations, and assess stipulations for effectiveness. The WMPP will facilitate our ability to pinpoint problems (including the evaluation of other contributing factors), design Project Plans which include conservation for declining species, monitor the effectiveness of decisions, and make recommendations to adjust management to address specific situations.

AREA AND OBJECTIVES

The WMPP document is the framework for wildlife monitoring and protection across the Powder River and Billings Resource Management Plan areas (approximately 6.5 million acres) and provides a template for regional and/or project specific WMPP development. The BLM, Montana Fish Wildlife and Parks (MFWP), and United States Fish and Wildlife Service (FWS) will work cooperatively to implement portions of the WMPP over the planning area. There are two basic layers of analysis, the Plan of Development (POD), and the Powder River Basin in Montana.

As energy development begins, POD specific WMPPs, following the same template as this document, will be written in cooperation with other agencies, Operators, landowners and other interests. The POD analysis will include wildlife impacts from the POD area, and also the cumulative impacts from other PODs (including those of other companies) as well as other activities in the area. The objectives of the program are to:

- Establish a framework for cooperation among agencies, Operators, landowners, Tribal Governments and interest groups;
- Provide a process for data collection, data management and reporting ;
- Determine needs for inventory, monitoring and protection measures;
- Provide guidance and recommendations for the conservation of wildlife species;
- Establish protocols for biological clearances of Special Status Species;
- Meet the terms and conditions of the Biological Opinion;
- Determine if management practices to conserve wildlife species and habitat in lease stipulations and conservation measures contained in the BLM Record of Decision, CBNG Project Plans or Oil and Gas APDs are meeting specified objectives;
- Develop recommendations to adjust management actions based on field observations and monitoring.

Implementation of the WMPP will begin with the issuance of the *Record of Decision* and will remain in effect for the life of the project (approximately 25 years). Guidance for the conservation of special status species will be incorporated into the "Project Plan of Development Preparation Guide." Signatories on an Interagency Cooperative Agreement will serve as the "*Steering Committee (Interagency Working Group).*" A "*Core Team*" (i.e., agency biologists) will oversee the implementation of the programmatic elements of the WMPP. As energy development is initiated within the Montana portion of the Powder River Basin, Operator funded biologists, approved by the BLM, will write area-specific monitoring and protection plans. These plans will be reviewed by the BLM resource specialists for completeness and content.

The programmatic template will undergo an annual review, at least initially, for effectiveness. A major review will be conducted every 5 years, or as determined by members of the *Core Team, Wildlife, and Aquatic Task Groups*. The various cooperators will meet annually (or more often as needed) to evaluate the progress of the various POD inventory and monitoring efforts.

IMPLEMENTATION PROTOCOL

This section provides preliminary wildlife inventory, monitoring, and protection protocol. Required actions for inventory, monitoring and protection vary by species and development intensity. In areas of development with > 1 well location per section, additional actions in Table 3 become applicable. Standard protocol for Application for Permit to Drill (APD) and right-of-way (ROW) application field reviews are provided in Table 2. Alternative measures and protocols will be developed as determined by *Core Team* members in response to specific needs identified in annual reports. This document provides methods for a number of wildlife species/categories. Additional species/categories may be added based on needs identified in annual wildlife reports. The wildlife species/categories for which specific inventory, monitoring, and protection procedures will be applied were developed based on input provided by the public, other agencies, and the BLM during preparation of the DEIS.

Considerable efforts will be required by agency and operator personnel for plan implementation. Many of the annually proposed agency data collection activities are consistent with current agency activities. Additionally, agency cost-sharing approaches will be considered such that public demands and statutory directives are achieved.

ANNUAL REPORTS AND MEETINGS

State and federal agencies will cooperate to implement the programmatic elements of inventory, monitoring and protection actions associated with CBNG development in the Powder River and Billings Resource Management Plan areas. The Montana participants in the Interagency Working Group will oversee implementation across the planning area and summarize information from work achieved in various PODs.

During project development (i.e., 25 years), to include habitat restoration or rehabilitation efforts, Operators will annually provide an updated inventory and description of all existing project features (i.e., location, size, and associated level of human activity at each feature), as well as those tentatively proposed for development during the next 12 months. These data will be coupled with annual wildlife inventory, monitoring, and protection data

obtained for the previous year and included in annual reports. Annual reports will be prepared by the BLM. Annual wildlife inventory, monitoring, and protection data gathered by parties other than the BLM (e.g., Operators, MFWP) should provide data/summaries to the BLM using current format standards. Upon receipt of this information, annual reports will be completed in draft form by the BLM and submitted to the Operators, FWS, MFWP, and other parties. A 1-day meeting of the *Core Team* will be organized by the BLM and held in early December of each year to discuss and modify, as necessary, proposed wildlife inventory, monitoring, and protection protocol for the subsequent year. Additional meetings will be scheduled as necessary.

Discussions regarding annual Operator-specific financing and personnel requirements will occur at these meetings. A formula for determining these requirements will be developed at the first year's meeting (i.e., size of development, anticipated impacts, amount of public land, etc.). A protocol regarding how to accommodate previously unidentified development sites will also be determined during the annual meeting. Final decisions will be made by the BLM based on the input of all affected parties.

A final annual report will be issued by BLM to all potentially affected individuals and groups by early February of each year. Annual reports will summarize annual wildlife inventory and monitoring results, note any trends across years, identify and assess protection measures implemented during past years, specify monitoring and protection measures proposed for the upcoming year, and recommend modifications to the existing WMPP based on the effectiveness and/or ineffectiveness of past years (i.e., identification of additional species/categories to be monitored). Where possible, data presented in reports will be used to identify potential correlations between development and wildlife productivity and/or abundance. The BLM will be the custodian of the data and stored in BLM's Geographic Information System (GIS) for retrieval, and planning unless otherwise agreed to by BLM, MFWP and FWS. Raw data collected each year will be provided to other management agencies (e.g., USFWS, MFWP) at the request of these agencies. In addition, sources of potential disturbance to wildlife will be identified, where practical (e.g., development activities, weather conditions, etc.). Inventory and monitoring data will be shared on a timely basis by all cooperating agencies.

Additional reports may be prepared in any year, as necessary, to comply with other relevant wildlife laws, rules, and regulations (e.g., black-footed ferret survey reports, mountain plover, sage grouse lek counts and bald eagle habitat loss reports).

ANNUAL INVENTORY AND MONITORING

This document outlines the inventory and monitoring protocol for a number of selected wildlife species/categories. Protocol will be unchanged except as authorized by the BLM or specified in this plan. Additional wildlife species/categories and associated surveys may be added or wildlife species/categories and surveys may be omitted in future years, depending on the results presented in the coordinated review of annual wildlife reports. MFWP will be contacted during the coordination of survey and other data acquisition phases. Opportunistic wildlife observations may be made throughout the year by agency and Operator personnel.

The frequency of inventory and monitoring will be dependent upon the level of development. In general, inventory and monitoring frequency will increase with increased levels of development. The level of effort should also be determined by species presence and development projection. Inventory and monitoring results may lead to further currently unidentifiable studies (i.e., cause and effect). The following sections identify the level of effort required by the WMPP. Site and species-specific surveys will continue to be conducted in association with APD and ROW application or CBNG project field reviews.

Raptors (Including Bald Eagle and Burrowing Owl)

Raptor inventories will be conducted over the entire CBNG project area every 5 years by BLM and MFWP with financial assistance being provide by proponents. In potentially affected areas, baseline inventory should be conducted prior to the commencement of development to determine the location of raptor nests/territories and their activity status by the BLM, with Operator financial assistance. These inventories should be repeated every 5 years (in areas with 1 or less well locations/section) thereafter for the Life-of-the-Project (LOP) to monitor trends in habitat use. These surveys may be implemented aerially or from the ground. Operators may provide financial assistance for some work. Data collected during the surveys (both inventory and monitoring) will be recorded on BLM approved data sheets and entered into the BLM GIS database. Standardized, recommended wildlife survey protocols are identified in "Wildlife Survey Protocol for Coal Bed Natural Gas Development, Powder River Basin

Wildlife Taskforce" and/or as referenced in this appendix. BLM should be contacted prior to commencement of wildlife surveys to insure proper survey protocols are being utilized.

Nest productivity monitoring will be conducted by the BLM or a BLM approved biologist. Active nests located within 1 mile of project-related disturbance areas will be monitored between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings per nest). These surveys generally will be conducted from the ground. However, some nests may be difficult to observe from the ground due to steep and rugged topography and may require aerial surveys. Operators may provide financial assistance for aircraft rental as necessary. Attempts will be made to determine the cause of any documented nest failure (e.g., abandonment, predation).

Additional raptor nest activity and productivity monitoring measures will be applied in areas with development (i.e., areas with > 1 well locations/section) on and within 1 mile of the project area. Inventory/monitoring efforts in these areas, as well as selected undeveloped reference areas will be conducted annually during April and May, followed by nest productivity monitoring. Site and species-specific nest inventories will also continue to be conducted as necessary in association with all APD and ROW application field reviews.

All raptor nest/productivity surveys will be conducted using procedures that minimize potential adverse effects to nesting raptors. Specific survey protocol for reducing detrimental effects are listed in Grier and Fyfe (1987) and Call (1978) and include the following:

- Nest visits will be delayed for as long as possible during the nesting season.
- Nests will be approached cautiously, and their status (i.e., number of nestling/fledglings) will be determined from a distance with binoculars or a spotting scope.
- Nests will be approached tangentially and in an obvious manner to avoid startling adults.
- Nests will not be visited during adverse weather conditions (e.g., extreme cold, precipitation events, windy periods, or during the hottest part of the day).
- Visits will be kept as brief as possible.
- Inventories will be coordinated by the BLM.
- The number of nest visits in any year will be kept to a minimum.

Ferruginous Hawk: Timing of surveys is very important in documenting the territory, occupancy, success and productivity of ferruginous hawk populations. The accepted survey and monitoring guidelines for ferruginous hawk are taken from the *Survey and Monitoring Guidelines for Ferruginous Hawks in Montana, 1995.*

Bald Eagle: Inventory and monitoring protocol for the bald eagle will be as described for raptors, with the following additions. Operators will indicate the presence of eagle habitat (nesting, foraging, roosting, winter) as previously defined, on their application. Prior to CBNG development or construction, surveys of the wooded riparian corridors within 1.0 mile of a project area will be conducted in the winter and/or spring by BLM biologists and/or BLM-approved biologists to determine the occurrence of winter bald eagle roost sites/territories. Surveys will be conducted from daybreak to 2 hours after sunrise and/or from 2 hours before sunset to 1 hour after sunset by fixed-wing aircraft. Follow-up ground surveys, if necessary, will be conducted during the same time frame. Surveys will be at least 7 days apart. The location, activity, number, and age class (immature, mature) of any bald eagles observed will be recorded. If a roost or suspected roost is identified, BLM, FWS, and MFWP will be notified and a GPS record of the roost/suspected roost will be obtained and entered into the BLM GIS database. There will be No Surface Occupancy within 0.5 miles of any identified bald eagle roost site/territories.

Nest productivity will be conducted by the BLM or a BLM-approved biologist on and within 1 mile of the project area. Active nests located within one mile of project-related disturbance areas (well sites, pipelines, roads, compressor stations, and other infrastructure) will be monitored on an annual basis between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings per nest).

Burrowing owl: Operators should indicate the presence of prairie dog towns on their application. The presence of sensitive habitat does not indicate burrowing owls are present. It does, however, alert the company and BLM a field review and surveys may be required to process the permit or initiate action. In association with APD and ROW application field reviews, prairie dog colonies within 0.5 miles of a proposed project or any other suitable habitat within a .5 mile radius area, will be surveyed for western burrowing owls by BLM biologists or a BLM-approved Operator-financed biologist twice yearly from June through August to determine the presence/absence of nesting owls. Efforts will be made to determine reproductive success (no. of fledglings/nest).

Threatened, Endangered, Candidate, and Other Species of Concern

Operators must identify and map the presence of cottonwood riparian, herbaceous riparian or wet meadows, permanent water or wetlands, prairie dog towns, or rock outcrops, ridges or knolls on their application. The presence of sensitive habitat may not indicate a species is present. It does, however, alert the company and BLM a field review and surveys may be required to process the permit or initiate action. The level of effort associated with the inventory and monitoring required for threatened, endangered, candidate, and other species of concern (TEC&SC) will be commensurate with established protocol for the potentially affected species. Methodologies and results of these surveys will be included in annual reports or provided in separate supplemental reports. As TEC&SC species are added to or withdrawn from FWS and/or BLM lists, appropriate modifications will be incorporated to this plan and specified in annual reports.

TEC&SC data collected during the surveys will be provided only as necessary to those requiring the data for specific management and/or project development needs. Site- and species-specific TEC&SC surveys will continue to be conducted as necessary in association with all APD and ROW application field reviews. Data will be collected on BLM approved data sheets and entered into the BLM GIS database.

Black-footed Ferret

Operators should indicate the presence of prairie dog towns on their application. The presence of sensitive habitat does not necessarily indicate suitable black-footed ferret habitat is present. It does, however, alert the company and BLM that a field review and surveys may be required to process the permit or initiate action. BLM biologists and/or BLM-approved Operator-financed biologists will determine the presence/absence of prairie dog colonies within 0.5 miles of proposed activity during APD and ROW application field reviews. Prairie dog colonies on the area will be mapped to determine overall size following the approved methodology. Colony acreage will be determined using GIS applications. Colonies that meet FWS size criteria as potential black-footed ferret habitat (USFWS 1989) will be surveyed to determine active burrow density using the methods described by Biggins et al. (1993) or other BLM- and FWS-approved methodology.

Project activity will be located to avoid impacts to prairie dog colonies that meet FWS criteria as black-footed ferret habitat (FWS 1989). If avoidance is not possible, all colonies meeting the FWS size criteria and any colonies for which density estimates are not obtained will be surveyed for black-footed ferrets by an operator-financed, FWS-certified surveyor prior to, but no more than 1 year in advance of disturbance to these colonies. Black-footed ferret surveys will be conducted in accordance with FWS guidelines (FWS 1989) and will be conducted on a site-specific basis, depending on the areas proposed for disturbance in a given year as specified in the annual report. If a black-footed ferret or its sign is found during a survey, all development activity would be subject to recommendations from the *Montana Black-footed Ferret Survey Guidelines*, *Draft Managing Oil and Gas Activities in Prairie Dog Ecosystems with Potential for Black-footed ferret Reintroduction* and re-initiation of Section 7 Consultation with FWS.

Black-tailed and White-tailed Prairie Dog

The BLM will determine the acreage of occupied black-tailed and/or white-tailed prairie dog habitat within suitable mountain plover habitat on federally managed surface acres and federal mineral estate lands. Further, a reasonable effort should be made to estimate actual impacts, including habitat loss, CBNG development will have on occupied black-tailed and white-tailed prairie dog acres within suitable mountain plover habitat over the entire project area.

Prairie dog towns on BLM lands within 0.5 miles of a specific project area will be identified, mapped, and surveyed as described in the black-footed ferret section. On an annual basis, the BLM and/or a BLM-approved Operator-financed biologist will survey, at least a portion of, the prairie dog colonies, including the reference colonies. Prairie dog populations are subject to drastic population fluctuations primarily due to disease (plague). Therefore, efforts will be made to compare the data from the reference colonies with that obtained from the project areas, in order to monitor the response of prairie dog populations to CBNG development.

Mountain Plover

Surface use is prohibited within 1/4 mile of active mountain plover nest sites. Disturbance to prairie dog towns will be avoided where possible. Any active prairie dog town occupied by mountain plover will have Controlled Surface Use between April 1 and July 31, which may be reduced to Controlled Surface Use within 1/4 mile of an active nest,

once nesting has been confirmed. An exception may be granted by the authorized officer after the BLM consults with the FWS on a case-by-case basis and the operator agrees to adhere to the new operational constraints.

On federally managed surface acres, black-tailed and white-tailed prairie greater than 80 acres in size within suitable mountain plover habitat will have a no surface use stipulation from May 1 through June 15. Prior to permit approval, habitat suitability will be determined. The BLM, FWS and MFWP will estimate potential mountain plover habitat across the CBNG area using a predictive habitat model. Over the next 5 years, information will be refined by field validation using most current FWS mountain plover survey guidelines (FWS 2002c) to determine the presence/absence of potentially suitable mountain plover habitat. In areas of suitable mountain plover habitat, surveys will be conducted prior to ground disturbance activities by the BLM or a BLM-approved Operator biologist, using the FWS protocol at the project area, plus a 0.5 mile buffer. Efforts will be made to identify mountain plover nesting areas not subject to CBNG development, to be used as reference sites. Comparisons will be made of the trends in mountain plover nesting occupancy between these reference areas and areas experiencing CBNG development.

The BLM shall monitor loss of mountain plover habitat associated with all portions of this action (operators will indicate the presence of prairie dog towns or other mountain plover habitat indicators on their application). Suitable mountain plover habitat has been defined under 'critical habitat' for the mountain plover in FWS' Statewide Biological Opinion. The actual measurement of disturbed habitat will be the responsibility of the BLM or their agent (consultant, contractor, etc) with a written summary provided to the FWS' Montana Field Office, upon project completion or immediately, if the anticipated impact area is exceeded.

Gray Wolf

According to the *Biological Assessment for Coalbed Methane Production in Montana*, state lands and counties (Gallatin and Park Counties) bordering Yellowstone National Park would be surveyed in the spring for wolves, occupied dens, or scat prior to development. These surveys could be conducted from the air or from the ground. Areas in which wolves are observed would continue to be surveyed annually until reintroduction objectives are met. Efforts will be made to compare production and/or occupancy trends in wolf populations in these areas to a reference population in order to gain more reliable information regarding the response of wolves to CBNG development.

Sage-Grouse

BLM and MFWP will conduct sage grouse lek inventories over the CBNG project area every 5 years to determine lek locations. Surveys of different areas may occur during different years with the intent the high potential CBNG project areas will be covered at least once every 5 years. Inventories and protocol will be consistent with the *Montana Sage Grouse Conservation Plan*, coordinated by the BLM and MFWP. In areas with development, aerial inventories will be conducted annually on affected sections, 3 mile buffers, and selected undeveloped reference areas. Surveys may be conducted aerially or on the ground, as deemed appropriate by the BLM and MFWP. Operator may provide financial assistance.

Reference leks are leks located in similar habitat and within close proximity to areas currently being developed. These "reference leks" will be identified by BLM and MFWP.

Aerial surveys will be used for determining lek locations. BLM, MFWP or BLM-approved Operator-financed biologist will monitor sage-grouse lek attendance within 3 miles of areas having development such that all leks on these areas are surveyed at least once every 3 years. Data collected during these surveys will be recorded on BLM and MFWP approved data sheets and entered into the approved database. An effort should also be made to compare trends of the number of males/lek to reference leks.

Sage-grouse winter use surveys of suitable winter habitat within 3 miles of a project area will be coordinated by the BLM and implemented by the BLM and/or MFWP during November through February as deemed appropriate by these agencies, and results will be provided in interim and/or annual reports. Historical information of winter sage-grouse locations will be useful in focusing efforts in areas suspected of providing winter habitat. Sage-grouse winter habitat use surveys will be conducted when suitable conditions exist.

Big Game

Elk, mule deer, white-tailed deer, and pronghorn are the common big game species that occur within parts or all of the CBNG planning area. BLM and/or MFWP will collect annual big game seasonal habitat use data and make it available to Operators, Tribes and landowners. Big game use of seasonal habitats is highly dependent upon a

combination of environmental factors including terrain, forage quality and snow depth. Therefore, it is difficult to attribute changes in habitat use to a single factor. Comparisons in trends between big game seasonal habitat reference areas and seasonal habitats associated with CBNG development may provide some insight into the response of big game to CBNG development.

General Wildlife

Wildlife mortality observed in pits will be documented, reported to the BLM and FWS, and measures will be taken to prevent future mortality. If the dead animals are birds, they will be collected and kept for identification by someone with an appropriate salvage permit. Also, the pits would need to be "spot checked" by appropriate BLM or FWS personnel in insure compliance. In no cases would operators or other workers be allowed to be in possession of migratory bird carcasses. Well field access roads and other roads with project-related traffic increases will be monitored for wildlife mortality so that specific mitigation can be designed and implemented as deemed necessary by BLM, in consultation with MFWP.

Aquatic Species

Baseline aquatic inventories will be conducted in potentially affected areas by BLM and MFWP with Operator financial assistance, prior to development, in an effort to determine occurrence, abundance, and population diversity of the aquatic community. These inventories should be repeated as necessary in selected intermittent/perennial streams associated with produced water discharge, as well as selected intermittent/perennial streams associated with no produced water discharge (control sample site).

Natural fluctuations in species occurrence, abundance, and population diversity will be determined by comparing changes in control sample sites to baseline inventories. Changes in occurrence, abundance, and population diversity of the aquatic community in streams associated with produced water discharge may then be possible by comparing to the natural fluctuations.

Detection of a retraction in the range of a species, a downward trend in abundance, or reduced population diversity in systems with produced water discharge shall warrant a review of Project Plans and possible recommendations for adjustment of management to address the specific problems.

Aquatic groups to be inventoried and monitored will include:

-Benthic macroinvertebrates - Determine population diversity using Hess/kick net sampling protocol to measure species abundance and establish a diversity index.
-Amphibians and aquatic reptiles - Determine population diversity and abundance utilizing sampling methodologies being developed for prairie species.
-Non-game fish - Determine population diversity using electrofishing and seining.
-Algae (periphyton) – Determine population diversity.

PROTECTION MEASURES

Wildlife protection measures have been put in place through lease stipulations. The following sections from the FWS' Biological Opinion describe stipulations or mitigation that restrict activities through lease agreements or terms and conditions to reduce the likelihood of "take" of a federally listed species. For all stipulations and mitigation measures that include protection of specific habitats (e.g., sage-grouse winter habitat), identification of the specific habitat areas will be based on the best available science. This may include BLM surveys or information from other sources. For example, researchers at the University of Montana and Montana State University are developing sage-grouse habitat models that should provide better information on sage-grouse habitat areas than is currently available.

Lease stipulation

The lease stipulations were approved in the 1994 BLM Oil and Gas EIS. These are mandatory measures or actions developed as a result of wildlife research and input from agencies and Operators. Avoidance of important breeding, nesting, and seasonal habitats is the primary protection measure that will reduce the possibility of CBNG and Oil and Gas development having an impact on wildlife populations, productivity, or habitat use. Additional conservation measures will be incorporated through the Project Plan design or as Conditions of Approval. Data

collected during monitoring efforts and analyzed will be used to determine the appropriateness and the effectiveness of these measures throughout the CBNG project area. Based on the results of the monitoring data, these measures will be reviewed by the *Core Team*. As monitoring data are collected over time, it is likely some protection measures will be added, while others will be modified or removed in cooperation with other agencies and the *Core Team*. All changes in these protection measures will be reported, with a justification for the change, in annual reports. A RMP amendment may be required depending on the recommended change.

"Waivers" A lease stipulation may be waived by the Authorized Officer (AO) if a determination is made by the BLM, in consultation with MFWP and/or FWS, that the proposed action will not adversely affect the species in question.

"Exceptions" to protection measure may be granted by the AO, in coordination with FWS for T&E species and MFWP, if the Operator submits a plan that demonstrates impacts from the proposed action will not be significant, or can be adequately mitigated.

"Modifications" may be made by the AO if it is determined portions of the area do not include habitat protected by the stipulation.

Raptors

From March 1 – August 1, all surface disturbing activities are prohibited within ½ mile of active raptor nest sites except ferruginous hawk, bald eagle and peregrine falcon nest sites. For ferruginous hawks and bald eagles, no surface occupancy or use will be allowed within ½ mile of known active nest sites. No surface occupancy or use is authorized within 1 mile of identified peregrine falcon nests. Active raptor nests are defined as those used within the last two years.

Big Game

Surface use is prohibited to avoid disturbance of white-tailed deer, mule deer, elk, pronghorn antelope, moose, and bighorn sheep during the winter use season, December 1 - March 31. This stipulation does not apply to the operation and maintenance of production facilities.

Elk Parturition Range

In order to protect identified elk parturition range, surface use is prohibited from April 1 to June 15 within established spring calving range. This protection measure does not apply to the operation and maintenance of production facilities.

Bighorn Sheep – Powder River Breaks

No surface occupancy or use is allowed in the designated Powder River Bighorn Sheep Range. In crucial winter range outside of the designated area, surface use is prohibited from December 1 to March 31.

Sage and Sharptailed Grouse

Lek sites
In order to minimize impacts to sharptailed and sage-grouse leks, surface occupancy within ¼ mile of leks is prohibited. The measure may be waived if the AO, in coordination with MFWP, determines the entire leasehold can be occupied without adversely affecting grouse lek sites, or if the lek sites within ¼ mile of the leasehold have not been attended for 5 consecutive years.

Nesting area
Surface use is prohibited between March 1 – June 15 in grouse nesting habitat within 2 miles of a known lek. This measure does not apply to the operation and maintenance of production facilities. This measure will be implemented to protect sharptailed and sage-grouse nesting habitat from disturbance during spring and early summer in order to maximize annual production of young, and to minimize disturbance to nesting activities adjacent to nesting sites for the long-term maintenance of grouse populations in the area.

Winter range
Surface use is prohibited from December 1 through March 31 within designated crucial winter range to protect sage-grouse from disturbance during winter season use.

Control of West Nile Virus
Manage produced water to reduce the spread of West Nile virus within sage-grouse habitat areas. Implement the following impoundment construction techniques to eliminate water sources that support breeding mosquitoes:

- Overbuild the size of ponds to accommodate a greater volume of water than is discharged. This will result in non-vegetated and muddy shorelines that breeding mosquitoes avoid.
- Build steep shorelines to reduce shallow water and aquatic vegetation around the perimeter of impoundments. Construction of steep shorelines also will increase wave action that deters mosquito production. Use of this construction technique could be harmful to certain wildlife species such as birds, and would require consideration on a cases by case scenario.
- Maintain the water level below rooted vegetation for a muddy shoreline that is unfavorable habitat for mosquito larvae. Rooted vegetation includes both aquatic and upland vegetative types. Always avoid flooding terrestrial vegetation in flat terrain or low lying areas.
- Construct dams or impoundments that restrict down slope seepage or overflow. Seepage and overflow results in down-grade accumulation of vegetated shallow water areas that support breeding mosquitoes.
- Line the channel where discharge water flows into the pond with crushed rock, or use a horizontal pipe to discharge inflow directly into existing open water, thus precluding shallow surface inflow and accumulation of sediment that promotes aquatic vegetation.
- Line the overflow spillway with crushed rock, and construct the spillway with steep sides to preclude the accumulation of shallow water and vegetation.
- Fence pond site to restrict access by livestock and other wild ungulates that trample and disturb shorelines, enrich sediments with manure and create hoof print pockets of water that are attractive to breeding mosquitoes.
- The following measures will also be employed for impoundments storing produced water:
- Use adulticides to target adult mosquito populations and larvicides to control the hatching of mosquito larvae, using approved pesticides and utilizing licensed applicators with a PUP.
- Introduce native fish species, such as fathead minnow or sand shiner, that would feed on mosquito larvae.
- Use electric, solar, or wind-powered fountains or aerators, which would create a ripple disturbance in the water surface and dissuade mosquitoes from laying eggs. This would also have the added effect of aerating the water to support a fish population and help prevent against winter fish die-off.
- Use a vertical discharge pipe in the center of the impoundment to create a ripple effect and aerate the water to support a fish population.

Prairie Dog Towns and Associated Black-footed Ferret Habitat

Prior to surface-disturbing activities, prairie dog colonies and complexes 80 acres or more in size and containing at least 5 burrows per acre will be examined to determine the presence or absence of black-footed ferrets. The findings of this examination may result in some restrictions to the operator's plans or may even preclude use and occupancy.

The lessee or operator may, at their own option, conduct an examination on the leased lands to determine if black-footed ferrets are present if the proposed activity would have an adverse effect or if the area can be block cleared. This examination must be done by, or under the supervision of, a qualified resource specialist approved by the BLM. An acceptable report must be provided documenting the presence or absence of black-footed ferrets and identifying the anticipated effects of the proposed action on the black-footed ferret and its habitat. This stipulation does not apply to the operation and maintenance of production facilities.

Interior Least Tern

The interior least tern is listed as an endangered species under the ESA. Birds occupy sandbars and graveled islands in eastern Montana and along the Yellowstone and Missouri Rivers. Surface occupancy and will be prohibited within 1/4 mile of wetlands identified as interior least tern habitat.

Terms and Conditions from Section 7 Consultation

In order to be exempt from the prohibitions of Section 9 of the Act, the Bureau must comply with the following terms and conditions, which implement the reasonable and prudent measures described and outlined in the Biological Opinion. **These terms and conditions are nondiscretionary.**

All Species

In the event wildlife species (dead or injured) are located during construction and operation, the FWS' Billings Sub-Office of the Montana Field Office (406-247-7366) and Law Enforcement Office (406-247-7355) will be notified within 24 hours. If the dead animals are birds, they will be collected and kept for identification by someone with an appropriate salvage permit. Also, the pits would need to be "spot checked" by appropriate BLM or FWS personnel in insure compliance. In no cases would operators or other workers be allowed to be in possession of migratory bird carcasses. The action agency must provide for monitoring the actual number of individuals taken. Because of difficulty in identification, all small birds found dead should be stored in a freezer for the FWS to identify.

- The Bureau shall monitor all loss of bald eagle (nesting, potential nesting and roost sites) and suitable mountain plover habitat associated with all actions covered under the *Montana Statewide Draft Oil and Gas EIS and Amendment of the Powder River and Billings RMPs* and ROD. Bald eagle nesting, potential nesting and roost sites, and suitable mountain plover habitat have been defined under 'habitat use' and critical habitat' respectively, for each species in the Biological Opinion. The actual measurement of disturbed habitat can be the responsibility of the BLM or their agent (consultant, contractor, etc), with a written summary provided to the FWS' Montana Field Office upon project completion. The report will include the location and acres of habitat loss, field survey reports, what stipulations were applied, and a record of any variance granted to timing and/or spatial buffers. The monitoring of habitat loss for these species will commence from the date the Record of Decision (ROD) is signed. The actual measurement of disturbed habitat can be the responsibility of the Bureau's agent (consultant, contractor, etc.) with a written summary provided to the FWS' Montana Field Office semi-annually, or immediately if the Bureau determines the action (*i.e.* Application for Permit to Drill (APD), pipeline, compressor station) will adversely affect a listed species. It is the responsibility of the Bureau to ensure the semi-annual reports are complete and filed with the FWS in a timely manner. The semi-annual report will include field survey reports for endangered, threatened, proposed and candidate species for all actions covered under the *Montana Statewide Draft Oil and Gas EIS and Amendment of the Powder River and Billings RMPs* and ROD. The semi-annual reports will include all actions completed under this BO up to 30 days prior to the reporting date. The first report will be due 6 months from the signing of the ROD and on the anniversary date of the signing of the ROD. Reporting will continue for the life of the project.
- As outlined in the guidance and conservation measures in the CBNG Programmatic Wildlife Monitoring and Protection Plan for the Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans, "All new roads required for the proposed project will be appropriately constructed, improved, maintained, and signed to minimize potential wildlife/vehicle collisions. Appropriate speed limits will be adhered to on all project area roads, and Operators will advise employees and contractors regarding these speed limits."

Bald Eagle

- The Bureau shall require implementation of all conservation measures/mitigation measures identified in the Biological Assessment prepared for the project and dated October 2006 and wildlife inventory, monitoring, and protection protocol identified in the WMPP. The Bureau shall monitor for compliance with the measures and protocol. These are as follows:
- The appropriate standard seasonal or year-long stipulations for raptors or no surface occupancy for bald eagles as identified in the Billings Resource Management Plan (BLM 1983), Powder River Resource

Management Plan (BLM 1984), and Oil and Gas Resource Management Plan/ EIS Amendment (BLM 1992) will be applied. This includes No Surface Occupancy within ½ mile of nests active in the last 7 years and ½ mile of roost sites.

- Inventory and monitoring protocol for the bald eagle will be as described for raptors, with the following additions. Operators will indicate the presence of eagle habitat as previously defined, on their application. Prior to CBNG development or construction, surveys of the wooded riparian corridors within 1.0 mile of a project area will be conducted in the winter and/or spring by BLM biologists and/or BLM-approved biologists to determine the occurrence of winter bald eagle roosts. Surveys will be conducted from daybreak to 2 hours after sunrise and/or from 2 hours before sunset to 1 hour after sunset by aircraft. Follow-up ground surveys, if necessary, will be conducted during the same time frame. Surveys will be at least 7 days apart. The location, activity, number, and age class (immature, mature) of any bald eagles observed will be recorded and if a roost or suspected roost is identified, BLM, FWS, and MFWP will be notified and a GPS record of the roost/suspected roost will be entered into the approved database. No Surface Occupancy will be applied within 0.5 miles of any identified bald eagle roost sites.
- Nest productivity will be conducted by the BLM or a BLM approved biologist in areas with development (i.e., areas with greater than 1 well locations/section) and within 1 mile of the project area. Active nests located within one mile of project-related disturbance areas will be monitored between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings per nest).
- No new above-ground power line should be constructed within ½ mile of an active eagle nest or nest occupied within the recent past. No surface occupancy or use is allowed within 0.5 miles of known bald eagle nest sites which have been active within the past 7 years. All other actions will be consistent with the *Montana Bald Eagle Management Plan - July 1994*.
- Power lines will be built to standards identified by the Power Line Interaction Committee (2006) to minimize electrocution potential. The FWS has more specific recommendations that reaffirm and compliment those presented in the *Suggested Practices*. It should be noted these measures vary in their effectiveness to minimize mortality, and may be modified as they are tested. Local habitat conditions should be considered in their use. The FWS does not endorse any specific product that can be used to prevent and/or minimize mortality, however, we are providing a list of Major Manufacturers of Products to Reduce Animal Interactions on Electrical Utility Facilities.

New Distribution Lines and Facilities

The following represents areas where the raptor protection measures will be applied when designing new distribution line construction:

1.1 Bury distribution lines where feasible.
1.2 Raptor-safe structures (e.g., with increased conductor-conductor spacing) are to be used (i.e., minimum 60" for bald eagles would cover all species).
1.3 Equipment installations (overhead service transformers, capacitors, reclosers, etc.) are to be made raptor safe (e.g., by insulating the bushing conductor terminations and by using covered jumper conductors).
1.4 Jumper conductor installations (e.g., corner, tap structures, etc) are to be made raptor safe by using covered jumpers or providing adequate separation.
1.5 Employ covers for arrestors and cutouts.
1.6 Lines should avoid high avian use areas such as wetlands, prairie dog towns, and grouse leks. If not avoidable, use anti-perching devices to discourage perching in sensitive habitats such as grouse leks, prairie dog towns and wetlands to decrease predation and decrease loss of avian predators to electrocution.

Modification of Existing Facilities

Raptor protection measures to be applied when retrofitting existing distribution lines in an effort to reduce raptor mortality. Problem structures may include dead ends, tap or junction poles, transformers, reclosers and capacitor banks or other structures with less than 60" between conductors or a conductor and ground. The following modifications will be made:

2.1 Cover exposed jumpers.

2.3 Gap any pole top ground wires.
2.4 Isolate grounded guy wires by installing insulating link.
2.5 On transformers, install insulated bushing covers, covered jumpers, cutout covers and arrestor covers.
2.6 When raptor mortalities occur on existing lines and structures, raptor protection measures are to be applied (e.g., modify for raptor-safe construction, install perches, perching deterrents, nesting platforms, nest deterrent devices, etc).
2.7 Use anti-perching devices to discourage perching in sensitive habitats such as grouse leks, prairie dog towns and wetlands to decrease predation, and decrease loss of avian predators to electrocution.
2.8 In areas where midspan collisions are a problem, install effective line-marking devices. All transmission lines that span streams and rivers or in known or discovered raptor migration areas, should maintain proper spacing and have markers installed.

These additional standards to minimize migratory bird mortalities associated with utility transmission lines, will be incorporated into the Terms and Conditions for all APDs and stipulations for Right-Of-Way applications.

Mountain Plover

- The Bureau shall require implementation of the conservation measures for mountain plover as identified in the Biological Assessment dated October 2006, and wildlife inventory, monitoring, and protection protocol addressed in the *WMPP*. The Bureau shall monitor for compliance with the measures and protocol. These are as follows:

- Surface use is prohibited within 1/4 mile of active mountain plover nest sites. Disturbance to prairie dog towns will be avoided where possible. Any active prairie dog town occupied by mountain plovers will have a Controlled Surface Use stipulation applied between April 1 and July 31. This area may be reduced to No Surface Use within 1/4 mile of an active nest, once nesting has been confirmed. An exception may be granted by the authorized officer after the BLM consults with the FWS and the operator agrees to adhere to the new operational constraints.

- Due to the declining status of mountain plover in the analysis area and the need to retain the most important and limited nesting habitat, all active prairie dog colonies on federal surface within suitable mountain plover habitat will have No Surface Occupancy (NSO) applied. This NSO may be modified through an amendment to this biological opinion after analysis of impacts to this preferred nesting habitat is completed.

- BLM will determine the acreage of occupied black-tailed and white-tailed prairie dog habitat within suitable mountain plover habitat on federally managed surface and mineral estate lands. Further, a reasonable effort should be made to estimate the actual impacts, including habitat loss, CBNG development will have on occupied black-tailed and white-tailed prairie dog acres within suitable mountain plover habitat over the entire project area. The BLM, FWS, and cooperators will develop a survey protocol that may include prioritization of subsets of the project area to be analyzed. Based on the results of such analysis, NSO on active prairie dog habitat within suitable mountain plover habitat may be modified utilizing an amendment to the biological opinion.

- Prior to permit approval, habitat suitability will be determined. The BLM, FWS and MFWP will estimate potential mountain plover habitat across the CBNG area using a predictive habitat model. Over the next 5 years, information will be refined by field validation using most current FWS mountain plover survey guidelines (FWS 2002c) to determine the presence/absence of potentially suitable mountain plover habitat. In areas of suitable mountain plover habitat, surveys will be conducted prior to ground disturbance activities by the BLM or a BLM-approved biologist using the FWS protocol at a specific project area plus a 0.5 mile buffer. Efforts will be made to identify mountain plover nesting areas not subject to CBNG development as reference sites. Comparisons will be made of the trends in mountain plover nesting occupancy between these reference areas and areas experiencing CBNG development.

- BLM shall monitor all loss of mountain plover habitat associated with this action (operators will indicate the presence of prairie dog towns or other mountain plover habitat indicators on their application). Suitable mountain plover habitat has been defined under ‘critical habitat’ for the mountain plover in the Biological Opinion. The actual measurement of disturbed habitat can be the responsibility of the BLM, their agent

(consultant, contractor, etc) with a written summary provided to the FWS' Montana Field Office upon completion, or immediately if the anticipated impact area is exceeded relative to the estimated surface disturbances defined in the SEIS.

- If suitable mountain plover habitat is present, surveys for nesting mountain plovers will be conducted prior to ground disturbance activities, if ground disturbing activities are anticipated to occur between April 10 and July 10. Disturbance occurring outside this period is permitted, but any loss of mountain plover suitable habitat must be documented. Sites must be surveyed 3 times between the April 10 and July 10 period, with each survey separated by at least 14 days. The earlier date will facilitate detection of early-breeding plovers. A disturbance-free buffer zone of 1/4 mile will be established around all mountain plover nesting locations between April 1 and July 31. If an active nest is found in the survey area, the planned activity should be delayed 37 days, or seven days post-hatching. If a brood of flightless chicks is observed, activities should be delayed at least seven days (FWS 2002). Exceptions and/or waiver to stipulations can be made by the BLM, through consultation with the FWS.
- Roads will be located outside of nesting plover habitat where possible. Apply mitigation measures to reduce mountain plover mortality caused by increased vehicle traffic. Construct speed bumps, use signing or post speed limits as necessary, to reduce vehicle speeds near mountain plover habitat.
- Creation of hunting perches will be minimized within ½ mile of occupied nesting areas. Utilize perch inhibitors (perch guards) to deter predator use.
- Native seed mixes will be used to re-establish short grass vegetation during reclamation.
- There will be No Surface Occupancy of ancillary facilities (e.g., compressor stations, processing plants) within ½ mile of known nesting areas. Variance may be granted after consultation with the FWS.
- In habitat known to be occupied by mountain plover, no dogs will be permitted at work sites to reduce the potential for harassment of plovers.
- The FWS will provide operators and the BLM educational material illustrating and describing the mountain plover, its habitat needs, life history, threats, and development activities that may lead to incidental take of eggs, chicks, or adults. This information will be required to be posted in common areas and circulated in a memorandum among all employees and service providers.

Programmatic Guidance for the Development of Project Plans

Guidance for developing Project Plans and/or conservation measures applied as Conditions of Approval provide a full range of practicable means to avoid or minimize harm to wildlife species or their habitats. Operators will minimize impacts to wildlife by incorporating applicable WMPP programmatic guidance into Project Plans. Not all measures may apply to each site-specific development area and means to reduce harm are not limited to those identified in the WMPP. This guidance may change over time if new Conservation Strategies become available for Special Status Species or monitoring indicates the measure is not effective or unnecessary.

BLM and MFWP will work together to collect baseline information about wildlife and sensitive habitats possibly containing special status species. During the project development phase, Operators will identify potentially sensitive habitats and coordinate with BLM to determine which species or habitats are of concern within or adjacent to the project area. In areas where required site-specific wildlife inventories have not been completed, Operators and BLM will work cooperatively to achieve this. BLM's responsibilities under NEPA and ESA essentially are the same on split estate as they are with federal surface. BLM and Operators will seek input from the private surface owner to include conservation measures in split estate situations.

The following guidance and conservation measures are considered "features" or project "design criteria" to be used during Project Plan preparation. The design of projects can incorporate conservation needs for wildlife species or measures can be added as "Conditions of Approval." These types of conservation actions offer flexibility for local situations and help minimize or eliminate impacts to the species of interest.

1. Use the best available information for siting structures (e.g., storage facilities, generators and holding tanks) outside of the zone of impact in important wildlife breeding, brood-rearing and winter habitat based on the following considerations.
    a. size of the structure(s),

   b. level/type of anticipated disturbance
   c. life of the operation, and
   d. extent to which impacts would be minimized by topography.
2. Concentrate energy-related facilities when practicable.
3. Encourage development in incremental stages to stagger disturbance; design schedules that include long-term strategies to localize disturbance and recovery within established zones over a staggered time frame.
4. Prioritize areas relative to their need for protection, ranging from complete protection to moderate to high levels of energy development.
5. Develop a comprehensive Project Plan prior to POD or full field development activities to minimize road densities.
6. To reduce additional surface disturbance, existing roads and two-tracks on and adjacent to the CBNG project area will be used to the extent possible and will be upgraded as necessary.
7. Minimize stream channel disturbances and related sediment problems during construction of road and installation of stream crossing structures. Do not place erodible material into stream channels. Remove stockpiled material from high water zones. Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance. Time construction activities to protect fisheries and water quality.
8. Design stream-crossings for adequate passage of fish (if potential exists), minimize impacts on water quality, and at a minimum, the 25-year frequency runoff. Consider oversized pipe when debris loading may pose problems. Ensure sizing provides adequate length to allow for depth of road fill.
9. Use corridors to the maximum extent possible: roads, power, gas and water lines should use the same corridor whenever possible.
10. Avoid, where possible, locating roads in crucial sage grouse breeding, nesting and wintering areas and mountain plover habitats. Develop roads utilizing topography, vegetative cover, site distance, etc. to effectively protect identified wildlife habitats.
11. Conduct all road and stream crossing construction and maintenance activities in accordance with Agency approved mitigation measures and BMPs.
12. Utilize remote monitoring technologies whenever possible to reduce site visits thereby reducing wildlife disturbance and mortalities.
13. All new roads required for the proposed project will be appropriately constructed, improved, maintained, and signed to minimize potential wildlife/vehicle collisions and facilitate wildlife movement through the project area. Appropriate speed limits will be adhered to on all project area roads, and Operators will advise employees and contractors regarding these speed limits.
14. Road closures may be implemented during crucial periods (e.g., extreme winter conditions, and calving/fawning seasons). Personnel will be advised to minimize stopping and exiting their vehicles in big game winter range.
15. Roads no longer required for operations or other uses will be reclaimed if required by the surface owner or surface management agency. Reclamation will be conducted as soon as practical.
16. Operator personnel and contractors will use existing state and county roads and approved access routes, unless an exception is authorized by the surface management agency.
17. Use minimal surface disturbance to install roads and pipelines and reclaim sites of abandoned wells to restore native plant communities.
18. Reclamation of disturbed areas will be initiated as soon as practical. Native species will be used in the reclamation of important wildlife habitat. Wildlife habitat needs will be considered during seed mix formulation.
19. Locate storage facilities, generators, and holding tanks outside the line of sight and sound of important sage-grouse breeding habitat.
20. Minimize ground disturbance in sagebrush stands with documented use by sage-grouse:
    (a) breeding habitat – the lek and associated sagebrush;
    (b) nesting habitat – sagebrush within 4 miles of a lek; and
    (c) wintering habitat – sagebrush with documented winter use by sage-grouse.
21. Site new power lines and pipelines in disturbed areas wherever possible; remove overhead powerlines when use is complete.
22. Minimize the number of new overhead power lines in sage-grouse or mountain plover habitat. Use the best available information for siting powerlines in important sage-grouse breeding, brood-rearing, and winter habitat. Bury lines in sage-grouse and mountain plover habitat, when feasible.
23. Restrict timing for powerline installation to prevent disturbance during critical sage-grouse periods (breeding March 1 – June 15; winter December 1 –March 31).

24. If above ground powerline siting is required within 2 miles of important sage-grouse breeding, brood-rearing, and winter habitat, emphasize options for preventing raptor perch sites utilizing Avian Powerline Action Committee 2006 guidelines.
25. Encourage monitoring of avian mortalities by entering into a Memorandum of Understanding (MOU) with FWS and the state agencies to establish procedures and policies to be employed by the parties to lessen industry's liability concerns about the "take" of migratory birds.
26. Remove unneeded structures and associated infrastructure when project is completed.
27. Restrict maintenance and related activities in sage-grouse breeding/nesting complexes; 15 March -15 June, between the hours of 4:00-8:00 am and 7:00-10:00 pm.
28. Restrict noise levels from production facilities to 49 decibels (10 dBa above background noise at the lek).
29. Restrict use of heavy equipment that exceeds 49 dBa within 2 miles of a lek from 4-8am and 7-10pm during April 1 – June 30.
30. Protect, to the extent possible, natural springs from disturbance or degradation.
31. Design and manage produced water storage impoundments so as not to degrade or inundate sage-grouse leks, nesting sites and wintering sites, prairie dog towns or other Special Status Species habitats.
32. CBNG produced water should not be stored in shallow, closed impoundments or playas. Impoundments designed as flow through systems will lessen the likelihood selenium will bioaccumulate to levels adversely affecting other wildlife.
33. Develop offsite mitigation strategies in situations where fragmentation or degradation of Special Status Species habitat is unavoidable.
34. Protect reserve, workover, and production pits potentially hazardous to wildlife by netting and/or fencing as directed by the BLM to prevent wildlife access and minimize the potential for migratory bird mortality.
35. Reduce potential increases in poaching through employee and contractor education regarding wildlife laws. Operators should report violations to BLM and MFWP.
36. Operator employees and their contractors will be discouraged from possessing firearms while working.

Measures 3, 4, 20, 21, 24, 25, 29, and 30 were added for the SEIS/Amendment from the Management Plan and Conservation Strategies for sage-grouse in Montana (Montana Sage Grouse Work Group 2005).

Table 1. Summary of General Wildlife Reporting, Inventory, and Monitoring, CBNG Development; Powder River and Billings Resource Management Plans, CBNG Amendment (2002)

Action	Dates	Responsible Entity
Plans of development for outcoming years, showing general location of proposed development	Annually	Team (BLM, USFWS, MFWP, Operators)
Annual reports summarizing findings and presenting necessary protection measures	Annually	BLM with reviews MFWP, USFWS, Operators, and other interested parties
Meeting to finalize future year's inventory, monitoring, and protection measures	Annually	BLM with participation by USFWS, MFWP, Operators, and other interested parties
Inventory and Monitoring		
Big game use monitoring	When Applicable	MFWP with BLM assistance
Determine mountain plover habitat suitability	Prior to permit approval	BLM & operator assistance
In areas of suitable mountain plover habitat, conduct nest surveys in project area, plus a .5 mile buffer	Prior to ground disturbing activities	BLM & operator assistance
In areas of suitable mountain plover habitat, map active black-tailed prairie dog colonies on federal mineral estate.	Prior to permit approval	BLM & operator assistance
Active prairie dog colonies within .5 mile of a specific project area will be identified, mapped and surveyed	Prior to permit approval	BLM with MFWP & operator assistance
Raptor nest inventories (POD areas plus 1 mile buffer; burrowing owls excluded)	Every 5 years during April and May but prior to permit approval	BLM with MFWP & operator assistance
In areas with potential bald eagle winter roost sites/territories, conduct surveys within one mile of project area	Prior to ground disturbing activities	BLM & operator assistance
Conduct bald eagle nest inventories within .5 miles buffer of project area	Between March 1 and mid July	BLM & operator assistance
Monitor productivity at active bald eagle nests within one mile of project-related disturbance	Between March 1 and mid July	BLM & operator assistance
Raptor next productivity monitoring at active nests within one mile of project disturbance area	Annually March to mid-July	BLM with MFWP & operator assistance
Sage-grouse lek inventories (project area plus two mile buffer)	Every 5 years	BLM with MFWP & operator assistance

Action	Dates	Responsible Entity
Inventory and Monitoring (continued)		
Sage-grouse lek attendance monitoring on and within 2 miles of the RMU	Annually	BLM with MFWP & operator assistance will visit selected leks each year so that all leks will be visited annually
Threatened, Endangered & Sensitive species inventory/monitoring within selected CBNG development areas	When Applicable	BLM with MFWP & operator assistance
Other wildlife species inventory/monitoring within selected CBNG development areas	When Applicable	BLM with MFWP & operator assistance

Table 2. Summary of APD/ROW Survey and Protection Measures, CBNG Development within the Powder River and Billings Resource Management Plans

Protection Measure	Dates
Bald eagle nest surveys within 0.5 mile of project area	Yearlong
Bald eagle nest avoidance within 0.5 mile of active nests	No Surface Use or Occupancy
Bald Eagle Winter Roost surveys within 1 mile of project area	December 1 to April 1
Bald Eagle Winter Roost avoidance within 0.5 miles of roost site	No Surface Use or Occupancy
Black-footed ferret surveys	Prairie dog colonies > 80 acres
Mountain plover surveys within 0.5 miles of project area	May 1 to June 15
Active prairie dog colonies on federal surface in mountain plover habitat	BLM & operator assistance
Mountain plover nest/brood avoidance within .25 miles of project area	April 1 to July 31
Peregrine falcon nest avoidance within 1 mile of active nest	No Surface Use or Occupancy
Threatened, Endangered & Sensitive species surveys	As necessary
Threatened, Endangered & Sensitive species avoidance	As necessary
Big game crucial winter range avoidance	December 1 – March 31
Elk Parturition Range avoidance	April 1 – June 15
Big Horn Sheep – Powder River Breaks	No Surface Use or Occupancy
Prairie dog colony mapping and burrow density determinations	Yearlong
Raptor next survey/inventory within 0.5 miles of project area	Yearlong
Raptor nest avoidance within 0.5 miles of active nests	March 1 – August 1
Sage-grouse nesting habitat avoidance on areas within 2.0 miles of a lek	April 1 – June 30
Sage-grouse and sharp-tailed grouse lek avoidance within 0.25 miles of a lek	No Surface Use or Occupancy
Sharp-tailed grouse nesting habitat avoidance on areas within 0.5 mi. of a lek	March 1 – June 15
Western burrowing owl surveys (prairie dog colonies within 0.5 miles of disturbance)	June – August
General wildlife avoidance/protection	As necessary

Table 3. Additional Wildlife Inventory and Monitoring Measures On and Adjacent to Areas with High Levels of Development (4 Locations/Section), Powder River and Billings Resource Management Plans, CBNG Amendment (2001)

Action	Dates	Responsible Entity
Raptor nest inventory/monitoring on areas with development, plus a 1-mile buffer.	Annually during April and Mary	BLM surveyor with Operator-provided financial assistance
Raptor productivity monitoring on areas with development, plus a 1-mile buffer.	Annually during March-July	BLM surveyor with Operator-provided financial assistance for BLM volunteer support
Selected TEC&SC inventory/monitoring on suitable habitats in areas with development, plus a 1-mile buffer	Annually during spring and summer	BLM or Operator-financed BLM-approved biologist
Collect baseline information for benthic macroinvertebrates, amphibians and aquatic reptiles, algae and non-game fish. Monitor changes on selected streams	Baseline 1 – 2 years prior and annually over the life of the project	BLM surveyor with Operator-provided financial assistance
Sage-grouse lek inventory on areas of development plus a 2-mile buffer and selected undeveloped comparison areas	Every 5 years, mid-March to mid-May	BLM surveyor with Operator-provided financial assistance
Sage-grouse lek attendance monitoring on areas of development plus a 2-mile buffer and selected undeveloped comparison areas	Annually, mid-March to mid-May	Each known lek will be visited at least once annually by the BLM and/or Operator-financed BLM-approved biologist; subsequent visits will occur at BLM-selected leks by the BLM, and/or Operator-financed BLM-approved biologist
Others studies on areas with development and selected undeveloped comparison areas		USFWS and/or BLMA with Operator- and other party-provided financial assistance

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BIOLOGICAL ASSESSMENT for

COAL BED Natural Gas PRODUCTION

IN MONTANA

Prepared for

Bureau of Land Management (BLM),
Miles City and
Billings field Offices

October 2006

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BIOLOGICAL ASSESSMENT FOR COAL BED NATURAL GAS PRODUCTION IN MONTANA

1.0 INTRODUCTION

The Bureau of Land Management (BLM), Miles City and Billings Field Offices, Montana, are proposing changes in the coal bed natural gas (CBNG) development program. The Powder River and Billings Resource Management Plans (RMPs), as amended by BLM's 1994 *Oil and Gas Amendment of the Billings, Powder River, and South Dakota Resource Management Plans*, support conventional oil and gas development and limited CBNG exploration and development. The BLM proposes to amend the Billings and Powder River RMPs to address increased interest in CBNG in these RMP areas. An Environmental Impact Statement (EIS) was completed in 2003 to evaluate impacts arising from implementation of the amended RMPs. As a result of lawsuits filed against the BLM's Record of Decision (ROD), the U.S. District Court issued orders, dated February 25, 2005, and April 5, 2005, requiring the BLM to 1) prepare a Supplemental EIS (SEIS) to evaluate a phased development alternative for CBNG production, 2) include the proposed Tongue River Railroad in the cumulative impact analysis, and 3) analyze the effectiveness of water well mitigation agreements. An SEIS/Amendment is being prepared to further evaluate impacts from implementation of the amended RMPs in light of the issues identified by the U.S. District Court.

The oil and gas industry is experiencing growing interest and predicts further interest in the exploration and development of CBNG because of increasing energy demands and efforts to find alternative energy sources. Increased CBNG development would result in a major federal action with potential to significantly affect the environment. This Biological Assessment (BA) was compiled to consider the potential impacts on federally listed and proposed threatened and endangered (T&E) species from proposed changes to levels of CBNG exploration and development in Montana. The BLM is the lead agency for this BA. Designated cooperators—those who have signed a memorandum of understanding with the BLM—are the Environmental Protection Agency (EPA), Department of Energy (DOE), U.S. Army Corps of Engineers (USACE), Bureau of Indian Affairs (BIA), Montana Department of Environmental Quality (MDEQ), Montana Board of Oil and Gas Conservation (MBOGC), Crow Tribe of Montana, Lower Brule Sioux Tribe, and the following counties: Big Horn, Carbon, Golden Valley, Musselshell, Powder River, Rosebud, Treasure, and Yellowstone. The Northern Cheyenne Tribe has also collaborated on the development of this SEIS/Amendment.

This BA is being prepared pursuant to Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. The U.S. Fish and Wildlife Service (USFWS), as required under the ESA, provided a list of federal endangered, threatened, and proposed threatened and endangered species that may be present in the Planning Area (Table 1 and Appendix A). Eight federally listed threatened, endangered, and proposed for listing wildlife species potentially occur in the Planning Area. The list provided by the USFWS did not include any plant species. Under the ESA, the BLM must ensure that activities instigated under this action do not jeopardize the continued existence of any threatened, endangered, or proposed for listing species. The USFWS must concur that the BLM's actions will not jeopardize a listed species. One candidate species may also potentially be found in the project area. Although not subject to the extensive procedural provisions of the ESA, the USFWS encourages that no action be taken that could impact candidate species and contribute to the need to list the species.

Project Plans of Development (PODs) will be developed and approved using the programmatic guidance outlined in the Preferred Alternative, including the Wildlife Monitoring and Protection Plan (Wildlife Appendix of Draft SEIS/Amendment). Additional monitoring guidance support can be found in the Monitoring, Vegetation, and Mineral Appendices of the Draft SEIS/Amendment. PODs will include baseline inventory in areas where wildlife inventory has not been completed. Operators will be required to submit a Project POD demonstrating how their project design minimizes or mitigates impacts to surface resources and meets objectives for wildlife. Both the Preferred Alternative and the Wildlife Monitoring and Protection Plan involve a cooperative approach, which incorporates adaptive environmental management principles and establishes a framework encouraging industry, landowners, and agencies to work together constructively to incorporate conservation measures into CBNG development. All CBNG development will follow the programmatic guidance to address wildlife concerns, and each individual Project POD will include a site-specific Wildlife Monitoring and Protection Plan which includes mitigation measures specific to species or local habitats. Over the life of the CBNG project, these plans offer some assurances that management will be adapted to address site-specific situations.

TABLE 1
FEDERALLY-LISTED THREATENED, ENDANGERED, AND PROPOSED FOR LISTING SPECIES

Common Name	Scientific Name	Habitat in Montana	Federal Status
Listed Species			
Whooping crane	*Grus americana*	Wetlands, croplands; transient statewide.	E
Bald eagle	*Haliaeetus leucocephalus*	Forested riparian areas throughout the state	T
Interior least tern	*Sterna antillarum athalassos*	Sandbars and islands in eastern Montana and along the Yellowstone and Missouri Rivers.	E
Gray wolf	*Canis lupus*	Adapted to many habitats, need large ungulate prey base and freedom from human influence.	E/XN
Canada lynx	*Felis lynx canadensis*	Montane spruce/fir forest in western Montana.	T
Black-footed ferret	*Mustela nigripes*	Prairie dog complexes in eastern Montana	E/XN
Grizzly bear	*Ursus arctos horribilis*	Alpine/subalpine coniferous forest in western Montana.	T
Pallid sturgeon	*Scaphirhynchus albus*	Bottom dwelling fish of the Missouri and Yellowstone Rivers	E
Candidate Species			
Montana Arctic grayling	*Thymallus arcticus*	Fluvial populations in the cold-water, mountain reaches of the Upper Missouri River, and dispersed streams in SW Montana.	C

T=threatened; E=endangered; E/XN= endangered/non-essential, experimental; C=candidate.

2.0 PROJECT DESCRIPTION

Three action alternatives plus a No Action Alternative and a Preferred Alternative were originally proposed in the 2003 Final EIS (Alternatives A through E). The SEIS/Amendment has proposed two additional action alternatives that consider phased development, as well as a new Preferred Alternative. The Preferred Alternative discussed in this BA was selected based on an analysis of impacts for all alternatives.

Exploration and development of CBNG resources on BLM, state, or fee minerals are allowed subject to agency decisions, lease stipulations, permit requirements, and surface owner agreements. Under the Preferred Alternative, operators would be required to submit a Project POD outlining the proposed federal well development of an area when requesting CBNG well densities greater than 1 well per 640 acres. The Project POD would be developed in consultation with the affected surface owner(s), tribes, other affected parties, and other involved permitting agencies. All shallow coal seams would have vertical wells installed; for deeper coal seams, the operator would drill directionally or demonstrate in the Project POD for agency consideration why directional drilling is not needed or feasible. Operators would develop single or multiple coal seams per their Project PODs; however, there would be only one well bore per coal seam per designated spacing restriction. Operators would also be required to demonstrate in their Project PODs how impacts to surface resources, such as wildlife, would be minimized or mitigated.

Protection of hydrological resources was one of the most critical concerns addressed during the development of the Final EIS and SEIS/Amendment, receiving significant analysis with regards to various options for the management of water produced with CBNG development. In light of those analyses, the Preferred Alternative combines management options so that no degradation of water quality would be allowed in any watershed. The hierarchy for water management options requires beneficial use as the first priority, followed by the operator's choice as outlined in a Water Management Plan, which must be submitted as part of the federal Project POD. A Water Management Plan would be required for exploratory wells, and for each Project POD. Management options available include injection, treatment, impoundment, discharge, or other operator-proposed methods, provided they are addressed in the Water Management Plan and approved by the appropriate agency. Impoundments proposed as part of the Water Management Plan would be designed and located to minimize or mitigate impacts to soil, water, vegetation, and channel stability. No discharge of produced water (treated or untreated) would be allowed into the watershed unless the operator has an approved Montana Pollutant Discharge Elimination System (MPDES) permit and can demonstrate in the Water Management Plan how discharge could occur in accordance with water quality laws without damaging the watershed. The Preferred Alternative also includes a water screen to further protect the quality of water within individual 4th order watersheds. The water screen requires that the cumulative volume of untreated CBNG produced water that could be discharged to surface waters would be limited to 10 percent of the 7Q10 flow. The allowable volume of discharged water would be calculated cumulatively based on permitted outfalls. If the cumulative 10 percent of 7Q10 limit was already used, within a watershed, the proposed discharge from federal APDs would need to be managed by other practices. This limit is based on the amount of discharge allowed under an MPDES permit without exceeding Montana non-degradation criteria.

The air quality objectives for the proposed action include maximizing the number of wells connected to each compressor and requiring natural gas-fired engines for compressors and generators, except in areas with sensitive resources, including people, where noise is an issue. In those areas, the decibel level would be required to be no greater than 50 decibels measured at a distance of one-quarter mile from the compressor. This may require installation of an electrical booster at these locations.

Transportation corridors would be required for utilities, roads, and pipelines with existing disturbances used where possible. The operator will also address in the Project POD how the surface owner was consulted for input into the location of roads, pipelines, and utility line routes. For powerlines, the operator will demonstrate in the Project POD how the proposal for power distribution would mitigate or minimize impacts to affected wildlife. For example, the operator may propose that all or a portion of the powerlines be buried and any aboveground lines be designed following raptor-safe specifications. When wells are abandoned, the associated oil and gas roads would remain open or be

closed at the surface owner's discretion. If the roads where requested to be closed they would be rehabilitated. This includes leaving BLM and state roads open, if access is desirable.

As with current management, there would be no buffer zone for CBNG production around active coal mines (Montana State Office Instruction Memorandum No. 2000-053, June 1, 2000, *No Surface Occupancy Stipulations*).

To help protect wildlife species other than sage-grouse that rely either seasonally or fully on sagebrush habitats (such as mule deer and migratory song birds; i.e. Brewer's sparrow and sage sparrow), the BLM would limit the amount of disturbance in such crucial habitat (e.g., the crucial brood rearing/breeding/wintering habitat) on its administered surface or on private surface overlying federal minerals. Crucial habitat polygons would be identified within each proposed POD during project application development. Annual monitoring of sage grouse leks near CBNG development and at reference locations will be used to assess the need for additional management actions to prevent impacts. A negative change in sage-grouse males on the CBNG leks may result in changes in management. Ongoing research and monitoring in the Powder River Basin might cause the BLM to modify the threshold percentage for via adaptive management or mitigation.

To protect sage-grouse, the BLM would place conditions on development within crucial sage-grouse habitat areas. For any development to occur in these crucial habitat areas, there must be a high likelihood that the development will not displace the sage-grouse from the habitat areas. This condition may lead to significantly different development approaches within the crucial sage-grouse habitat areas, which could include low intensity development, widely-spaced well locations, and other options. For sage-grouse, the following threshold would be used to initiate management change as a result of monitoring:

- A 25 percent or more decline of male sage-grouse attendance on leks within two miles of CBNG development in crucial sage-grouse habitat in comparison to control leks. Similarly, if populations remain comparable with the control leks or increase over a five year monitoring period, management of development may be modified to be less restrictive

For proposed federal CBNG development within 5 miles of the Northern Cheyenne and Crow Indian Reservations, the BLM, in consultation with the tribes, would require site-specific groundwater and air analyses. These analyses would be submitted as part of the operator's POD submissions. The operator's analyses must demonstrate that the overall POD would be protective of Indian Trust, groundwater, CBNG, and air quality. If the analysis indicated that unacceptable levels of impairment to these resources would occur and could not be mitigated in consultation with the tribes, the BLM would not approve the APDs. The BLM might require operator(s) to install groundwater monitoring wells and air monitoring stations between the development area and the reservations to confirm the initial findings of the analyses. Modeling and monitoring groundwater would also provide critical data to determine if CBNG resources were being affected.

This BA addresses environmental impacts from implementation of the Preferred Alternative.

2.1 Project Location

The project is located across south-central and southeastern Montana. This area includes parts of thirteen counties: Carter, Powder River, Custer, Rosebud, Treasure, Wheatland, Sweet Grass, Stillwater, Carbon, Golden Valley, Musselshell, Yellowstone, and Big Horn.

Because of the extensive area covered, Map 1 is provided instead of legal descriptions.

The planning area shown in Map 1 is defined as the area where oil and gas decisions will be made by the BLM. The BLM's planning area is the oil and gas estate administered by the BLM in the Powder River and Billings RMP areas. The planning area excludes those lands administered by the U.S. Department of Agriculture (USDA) Forest Service (USFS), the Crow Tribe, Northern Cheyenne Tribe, and other Indian lands.

For ease of reference, the Billings and Powder River RMP areas are collectively referred to in this document as the BLM CBNG Planning Area. This 13-county area is where there is CBNG development interest.

The Powder River RMP area encompasses the southeastern corner of Montana, including Powder River, Carter, and Treasure counties, and portions of Big Horn, Custer, and Rosebud counties. The Powder River RMP area comprises approximately 1,080,675

acres of federally managed surface and 4,103,700 acres of federal mineral estate.

The Billings RMP area comprises the south-central portion of Montana consisting of Carbon, Golden Valley, Musselshell, Stillwater, Sweet Grass, Wheatland, and Yellowstone counties and the remaining portion of Big Horn County. The Billings RMP area comprises approximately 425,336 acres of federally managed surface and 906,084 acres of federal mineral estate.

Adjacent to the Planning Area, other major land holdings include the Crow and Northern Cheyenne Indian Reservations, the Custer National Forest, portions of Yellowstone National Park, the Big Horn Canyon National Recreational Area, the Burlington Northern and Santa Fe Railroad, and the Fort Keogh Agricultural Experiment Station. The total surface area of the CBNG Planning Area (all owners) exceeds 21.9 million acres.

2.2 Purpose and Need

The purpose of the project is to provide direction and analysis for CBNG exploration and development on the Powder River and Billings RMP areas.

The oil and gas analysis in current BLM planning documents did not predict as many wells. A BA to establish the impacts to federally listed species is needed to analyze the effects from increased CBNG and oil and gas development.

2.3 Construction Techniques

Each well project has four phases: exploration, development, operation, and shutdown. Once a well is in place, it is expected to operate for 20 years before abandonment. The BA focuses on the first two phases, exploration and development. These lead to the operation phase, once the well is in place.

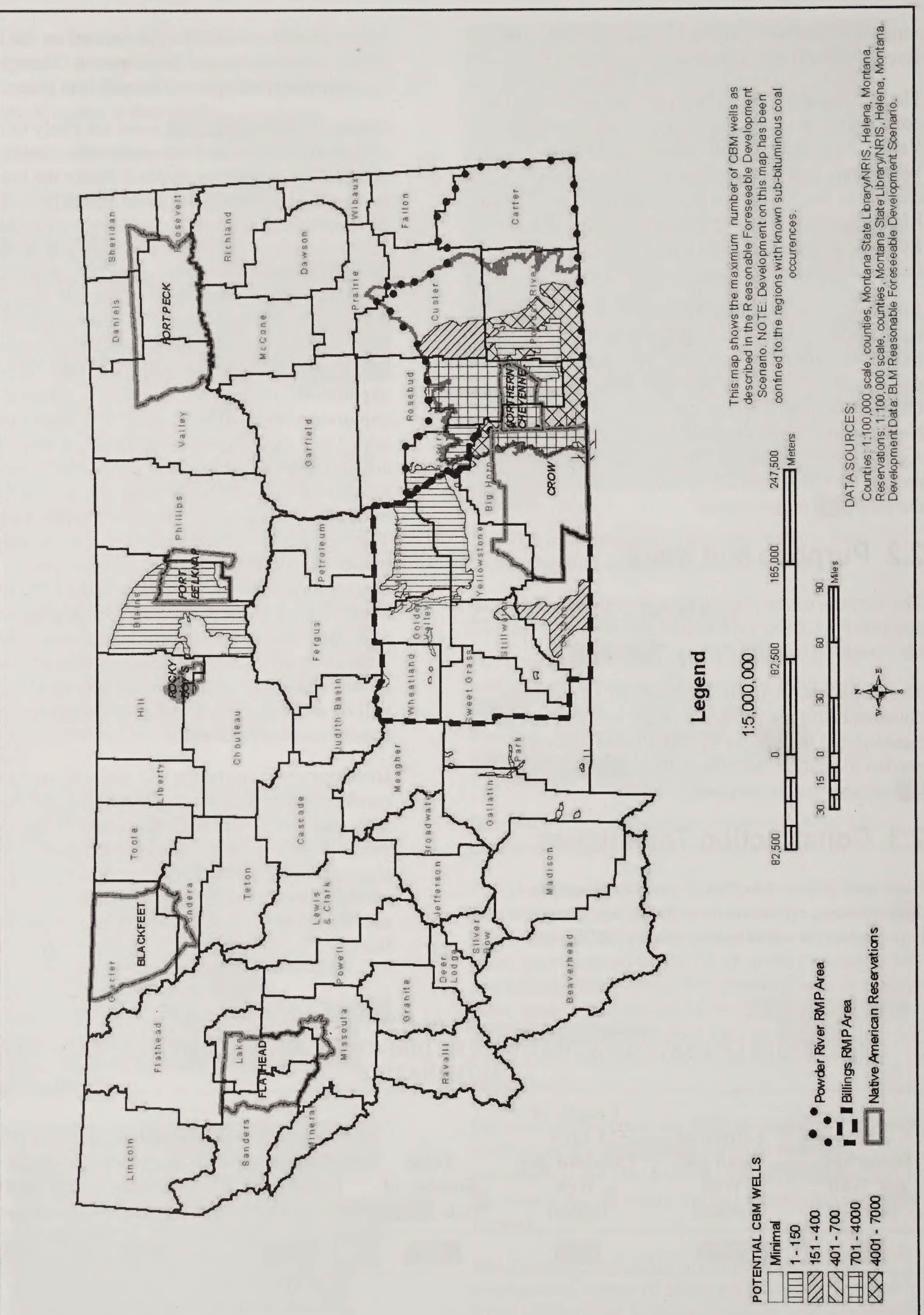
During development, 3.25 acres are likely to be disturbed for each well for exploration, construction, and drilling operations. Table 2 shows the land area that would be directly disturbed by CBNG development and the expected length of road and utility corridors. Under the Preferred Alternative, the use of transportation corridors to consolidate the placement of roads and utilities and minimize surface disturbance is required. It is also required that existing roads be used and utility corridors follow those existing roads if they are available. When exploratory construction begins on a site, the exploratory well will take about 3 to 5 days to drill, with 2 to 3 extra days to complete for CBNG if the site is developed. During the exploratory phase, wildlife species will be disturbed by the presence of bulldozers, drilling equipment, and other machinery. The short-term disturbance effect of the exploratory phase will end with either abandonment or continuation to the development stage if the well site is suitable for production. If the site is abandoned after exploration, the site will take approximately 5 years to attain preconstruction vegetative canopy cover values. Reclamation of the site with vegetation will be undertaken, but restoration to pre-project conditions is not planned.

Development disturbance will begin if exploration results in estimates of suitable levels of production. This and operational disturbance should be considered long-term because of the permanent placement of the pad. The materials source for roads would be located as close as possible to each project site, but no specific sources have been identified at this time.

TABLE 2
ESTIMATES OF LAND AREA THAT WILL BE DIRECTLY DISTURBED BY THE PREFERRED ALTERNATIVE

Area Disturbed per Well (acres)	Length of Road per Well (miles)	Length of Utility Corridor per Well (miles)	Total Number of Wells Drilled	Total Area Disturbed (acres)	Total Length of CBNG Roads (miles)	Total Length of Utility Corridors
3.25	0.237	0.734	18,225	59,045	6,662	20,623

Map 1: CBNG Development Based on Reasonable Foreseeable Development Scenario



3.0 DATA COLLECTION AND ASSESSMENT

Appropriate federal and state agencies were contacted to obtain information on specific habitats and areas within the project area where listed species may potentially occur. Research literature was reviewed for listed species. Biologists with knowledge of the area were interviewed before assessing impacts that could result from project implementation. Impacts would be considered significant if implementation of the Preferred Alternative would adversely affect any listed or proposed species, including destruction of occupied habitat or "taking" (harm, harassment, pursuit, injury, or kill) of federally listed wildlife or plant species.

3.1 Literature Studies

A literature search was conducted to determine habitat requirements for each listed species. Habitat requirements for listed species were then compared to terrestrial vegetation communities in the project area to determine the potential for occurrence of listed species. If suitable habitat was present, a literature search was completed to determine if existing site-specific or regional data on the species were available. The broad geographic area covered by this BA means that every species listed has some potential habitat within the proposed project's boundary.

3.2 Survey Methodologies

No specific surveys were conducted for this BA. Therefore, it is essential that clearance surveys be conducted on a site-by-site basis before CBNG exploration begins. Site clearances and field survey methodologies differ according to the species of interest.

3.2.2 MAMMALS

Four threatened, endangered, or proposed mammalian species potentially occur in the project area (Table 1). Two of the species, the black-footed ferret and gray wolf, are listed as experimental populations for specific regions within the state of Montana. Specific surveys need not be conducted for the gray wolf or the Canada lynx because of the unlikely possibility of actually observing these species even if they are present. Instead, reconnaissance-level surveys for signs of these species (scat and tracks) will be included with other biological surveys at individual project sites. In addition, in habitats with higher potential for these animals, specific transects will be put in place and checked for scat. If found, hair and track traps for lynx and grizzly bears will be used to determine positive presence. If wolves are suspected, taped howling reconnaissance surveys will be employed to ascertain whether these species are using the area for denning.

3.2.3 BIRDS

One threatened and two endangered bird species are known to or could occur in the project area. Specific surveys would include nesting surveys and winter foraging surveys. Consultation with local wildlife biologists will precede all exploratory CBNG activities within 1.6 miles of any waterway. This consultation will result in obtaining nesting and winter foraging information for bald eagles that may be impacted by CBNG activities. If nesting sites are known to occur within this radius of the proposed CBNG site or sites, a biologist will be retained to survey specifically for this species for the duration of both the exploration and development phases in that locale. If the proposed CBNG site is found to be within a nesting or winter foraging area, CBNG work will be halted until the nest is no longer active or until winter has passed and the foraging eagles have migrated. BLM leasing stipulations pertaining to bald eagles apply and will be implemented.

Interior least terns are colonial nesting waterbirds that seldom swim, spending much of their time on the wing (Hubbard 1978). Therefore, clearance surveys that search for flying birds or nesting colonies will be done in appropriate habitats, sand bar river areas, or nearby sand pits, in the spring by a qualified biologist prior to exploration and well development.

Because whooping cranes are rare migrants in the planning area vicinity and do not nest or winter in the area, surveys for these birds will not be conducted.

4.0 PROJECT CONDITIONS

This section discusses habitat requirements and distributions of species listed or proposed for listing by the USFWS as endangered or threatened, the status of the species or habitat within the project area, potential impacts from project implementation, conservation actions, and an impact determination. Habitat requirements and distribution data were obtained from Federal Register (FR) listing notices, conversations with federal and state biologists, and other published and unpublished research data.

4.1 Mammals

4.1.1 BLACK-FOOTED FERRET (*MUSTELA NIGRIPES*)

4.1.1.1 Habitat

This species was listed as endangered March 11, 1967, and is currently listed as endangered/experimental, non-essential in Montana. Historically, black-footed ferrets inhabited grassland plains (shortgrass and midgrass prairies) surrounded by mountain basins up to 3,250 meters (10,500 feet) in elevation (USFWS 1998). This species is always found in association with another grassland species, the prairie dog (*Cynomys* spp.; Burt and Grossenheider 1980, Cahalane 1954). Prairie dogs are the principle food of the black-footed ferret, and prairie dog burrows provide the ferret's principle shelter. Research has found that the black-footed ferret is more than just associated with the prairie dog, but is truly obligate and dependent upon this rodent for its survival as a species (Anderson et al. 1986, Biggins et al. 1986, Clark 1989, Forrest et al. 1988, Henderson et al. 1974, Hillman 1968, Miller et al. 1996). Data suggest that a ferret needs a prairie dog colony of at least 12.5 hectares (31.3 acres) to survive for a year and a minimum of 50 hectares (125 acres) to raise a litter (Caughley and Gunn 1996). Ferret range is coincident with that of prairie dogs (Anderson et al. 1986). There is no documentation of black-footed ferrets breeding outside of prairie dog colonies. Specimen records of black-footed ferrets are available from ranges of three species of prairie dogs: black-tailed prairie dog (*Cynomys ludovicianus*), white-tailed prairie dog (*Cynomys leucurus*), and Gunnison's prairie dog (*Cynomys gunnisoni*; Anderson et al. 1986).

Major causes for the decline in this species are long-term prairie dog control efforts, the loss of habitat as a result of destruction of original grasslands, and canine distemper (Frey and Yates 1996). Recovery plans were approved in June 1978 and August 1988. These included captive breeding and release to protected habitats in the wild.

4.1.1.2 Distribution

Historically, this species' range included New Mexico, Arizona, Colorado, Utah, Kansas, Oklahoma, Texas, Wyoming, Nebraska, Montana, North Dakota, South Dakota, Alberta, and Saskatchewan. It was decimated from all of its former range, and distribution is now limited to introduced populations in Arizona, Wyoming, Montana, and South Dakota (USFWS 1998). Reintroduction efforts have been concentrated in these four states because they still have protected areas with large prairie dog colonies. Although the Wyoming effort has been hampered by disease problems, the other three states have shown some success (USFWS 1996). Reintroduction efforts began in 1991 in Wyoming, 1994 in Montana and South Dakota, and 1996 in Arizona.

4.1.1.3 Status in the Project Area

Based on surveys conducted to date, black-footed ferrets are not known to occur in the project area. However, one of the potential black-footed ferret reintroduction sites recommended by the Montana Black-Footed Ferret Coordinating Committee is located within the project area in Custer County. If a proposal is made by the USFWS and the Montana Department of Fish, Wildlife and Parks (MFWP) to reintroduce the black-footed ferret in this area, further coordination to avoid impacts will be required.

4.1.1.4 Project Impact

Black-footed ferrets are exclusively found associated with their main prey species: prairie dogs. Prairie dogs are found throughout the project area. Any activity affecting prairie dog colonies has the potential to impact the ferret.

4.1.1.5 Conservation Measures

Two BLM leasing stipulations address black-footed ferret concerns. The first states that exploration in prairie dog colonies within potential black-footed ferret reintroduction areas comply with the Draft *Guidelines for Oil and Gas Activities in Prairie Dog Ecosystems Managed for Black-footed Ferret Recovery* (USFWS 1990). Compliance with these guidelines is required, and they specify that

conditions of approval depend on the type and duration of the proposed activity, proximity to occupied ferret habitat, and other site-specific conditions. Exceptions or waivers of this stipulation may be granted if the Montana Black-Footed Ferret Coordination Committee determines the proposed activity would have no adverse impacts on ferret reintroduction or recovery. The second stipulation requires all prairie dog colonies or complexes greater than 80 acres in size be surveyed for black-footed ferret absence or presence through consultation with the FWS, prior to ground disturbance. The results of the survey determine whether restrictions or denial of use are appropriate for the site. Both of these stipulations will be implemented under the proposed action.

4.1.1.6 Determination

Provided strict adherence to BLM leasing stipulations, the proposed action will result in a "may affect, not likely to adversely affect" situation for black-footed ferrets.

4.1.2 CANADA LYNX (*LYNX CANADENSIS*)

4.1.2.1 Habitat

This species was listed as threatened on March 24, 2000. In the contiguous United States, the distribution of the lynx is associated with the southern boreal forest, comprised of subalpine coniferous forest in the West, and primarily mixed coniferous/deciduous forest in the East (Aubry et al. 1999); whereas in Canada and Alaska, lynx inhabit the classic boreal forest ecosystem known as the taiga (McCord and Cardoza 1982, Quinn and Parker 1987, McKelvey et al. 1999). Within these general forest types, lynx are most likely to persist in areas that receive deep snow, for which the lynx is highly adapted (Ruggiero et al. 1999).

According to the USFS (1993), lynx require three primary habitat components:

1. Foraging habitat (15- to 35-year-old lodgepole pine (*Pinus contorta*) to support snowshoe hare, the primary food source, and provide hunting cover).
2. Denning sites with patches of spruce and fir greater than 200 years old and generally smaller than 5 acres.
3. Dispersal and travel cover that is variable in vegetative composition and structure.

Abundance of snowshoe hare is the limiting factor for lynx. The hare is limited by the availability of winter habitat that includes early successional lodgepole pine with trees at least 6 feet tall.

4.1.2.2 Distribution

In the western United States, lynx historically occurred in the Cascades Range of Washington and Oregon; and the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado (McCord and Cardoza 1982, Quinn and Parker 1987).

4.1.2.3 Status in the Project Area

The range of lynx includes portions of four counties within the project area: Wheatland, Sweet Grass, Stillwater, and Carbon (MFWP 2006). Within this area, lynx are expected to occur within suitable subalpine coniferous forests and moist Douglas fir forests, especially those areas with dense, old growth providing lynx forage and denning areas, as well as young, dense forested stands providing lynx forage. The project area does not contain areas proposed by USFWS as critical lynx habitat (USFWS 2005a).

4.1.2.4 Project Impact

Although possible, exploration and development of CBNG are not expected to occur in higher elevation forests providing lynx habitat. If exploration or associated roads or utility lines were constructed within lynx habitat, the animals could be impacted by habitat loss and by disturbance.

4.1.2.5 Conservation Measures

Any drilling pads or other construction areas (e.g., road and utility line construction) located in suitable high elevation forested areas, especially areas with populations of hares or rabbits, would be surveyed prior to ground disturbance for scat and individuals following established protocols. If found, the site would be avoided and surrounded by a buffer zone as recommended by USFWS biologists.

4.1.2.6 Determination

Implementation of conservation measures will result in a "may affect, not likely to adversely affect" situation for Canada lynx.

4.1.3 GRAY WOLF (*CANIS LUPUS*)

4.1.3.1 Habitat

This species was listed as endangered on March 11, 1967, and is currently listed as endangered/experimental, non-essential in Montana. However, USFWS has recently concluded that delisting gray wolves in the Northern Rocky Mountains may be warranted (USFWS 2005b). The gray wolf can be found in any area, within their current range, that supports populations of hoofed mammals (ungulates), its major food source.

4.1.3.2 Distribution

The wolf was considered extirpated from the western portion of the conterminous United States by about 1930. The gray wolf is native to most of North America north of Mexico City, except for the southeastern United States, where a similar species, the red wolf (*Canis rufus*), was found. The gray wolf occupied nearly every area in North America that supported populations of hoofed mammals (ungulates). The gray wolf occurred historically in the northern Rocky Mountains, including mountainous portions of Wyoming, Montana, and Idaho. For 50 years prior to 1986, no detection of wolf reproduction was found in the Rocky Mountain portion of the United States.

A revised recovery plan for the Northern Rocky Mountain states (Montana, Wyoming, Idaho) was approved by USFWS in 1987 (USFWS 1987). It identified a recovered wolf population as being at least 10 breeding pairs of wolves, for 3 consecutive years, in each of three recovery areas (Central Idaho, Greater Yellowstone, and Northwestern Montana). A population of this size would be comprised of about 300 wolves. The plan recommended natural recovery in Montana and Idaho. The plan recommended use of ESA section 10(j) authority to reintroduce experimental wolves. By establishing a nonessential experimental population, more liberal management practices could be implemented to address potential negative impacts or concerns regarding the reintroduction. The final EIS was filed with the EPA on May 4, 1994, and the notice of availability was published on May 9, 1994. The EIS considered five alternatives: 1) Reintroduction of Wolves Designated as Experimental; 2) Natural Recovery (No Action); 3) No Wolves; 4) Wolf Management Committee Recommendations; and 5) Reintroduction of Wolves Designated as Non-experimental. After careful review, the USFWS proposed to reintroduce nonessential experimental gray wolves in Yellowstone Park and central Idaho. Wolves in the third recovery area, the Northwest Montana Recovery Area encompassing northwest Montana and the Idaho Panhandle, are covered fully by the ESA as endangered species. Under the Experimental Population Final Rule guidelines from 1994, 35 wolves were introduced into central Idaho and 66 wolves were introduced into Yellowstone National Park in 1995 and 1996.

In recent years, wolves in the Northern Rocky Mountain states have continued to increase in distribution and numbers, and recovery criteria have been met for removing Northern Rocky Mountain wolves from the Endangered Species list (USFWS et al. 2005). Estimates of wolf numbers at the end of 2004 were 452 wolves in the Central Idaho Recovery Area, 324 wolves in the Greater Yellowstone Recovery Area, and 59 in the Northwest Montana Recovery Area.

4.1.3.3 Status in the Project Area

Wolves in the project area vicinity are part of the experimental population originally introduced into Yellowstone Park. The most recent Rocky Mountain Wolf Recovery Annual Report estimates the population size of the experimental wolf population in southern Montana at 94 wolves (USFWS et al. 2005). The range of the Moccasin Lake, Phantom Lake, Red Lodge, and Beartooth wolf packs occur within, or partially within, the project area (USFWS et al. 2005). There are no active wolf den or rendezvous sites known to occur within the project area. However, the Red Lodge pack likely has a den site somewhere in the Red Lodge vicinity (Trapp, personal. comm. 2006).

4.1.3.4 Potential Impact

Roads and the presence of humans would increase the threat from shooting, either intentionally or accidentally (if mistaken for a coyote). The density of roads in occupied wolf areas could force wolves from occupied areas and could increase stress on wolves and result in the loss of some individuals.

4.1.3.5 Conservation Measures

Prior to construction on project area lands in counties where wolves are most likely to occur (Carbon, Stillwater, and Sweet Grass counties currently, with potential for additional counties in the future if wolves expand their range), surveys would include specific searches for this animal, occupied dens, or scat. If wolves or other wolf indicators were found, USFWS would be consulted and proper protocols

followed. Likely protocols include providing buffers around wolf den and rendezvous sites and limiting road density in areas of occupied wolf habitat.

4.1.3.6 Determination

Implementation of conservation measures will result in a "not likely to jeopardize" situation for this experimental/non-essential gray wolf population.

4.1.4 GRIZZLY BEAR (*URSUS ARCTOS HORRIBILIS*)

4.1.4.1 Habitat

This species was listed as endangered on March 11, 1967. This status was changed to threatened on July 28, 1975. On November 11, 2000, the USFWS listed some populations in Montana and Idaho as experimental to facilitate restoration to designated recovery areas. On June 20, 2001, Interior Secretary Gale Norton rescinded the plans for restoration and withdrew a plan to reintroduce grizzly bears into the Bitterroot ecosystem of Idaho and Montana. Current status for this species is threatened, although the Yellowstone distinct population segment (DPS) of grizzly bears has been proposed for delisting (USFWS 2005c).

The grizzly (or brown) bear was once found in a wide variety of habitats including open prairie, brushlands, riparian woodlands, and semidesert scrub. Most populations require vast areas of suitable habitat to prosper. They forage for wild fruits; nuts; bulbs; roots; insect larvae in logs; and carcasses of elk, deer, and cattle (Graham 1978, Mealey 1975, Schleyer 1983). This species is common only in habitats where food is abundant and concentrated, including white-bark pine, berries, and salmon or cutthroat runs, and where conflicts with humans are minimal (Reinhart 1990, Podruzny 1999). Research indicates it is important to maintain areas where grizzly bears can forage for a 24- to 48-hour period secure from human disturbance (Gibeau et al. 1996).

Winter dens are dug in north-facing slopes or more often at the base of large trees in areas away from humans in late fall or winter after snow has begun to fall (Crowed and Crowed 1972, Jonkel 1980, Judd et al. 1986, Vroom et al. 1980).

4.1.4.2 Distribution

This species once lived in a variety of habitats across most of North America. Grizzly bears now occupy only 2 percent of their original range in the lower 48 states in remote wilderness areas in Idaho, Montana, Wyoming, Alaska, and Washington.

4.1.4.3 Status in the Project Area

The current range of grizzly bears extends into the southwestern portion of the project area (Map 2). These bears are part of the Yellowstone grizzly bear DPS. On November 15, 2005, the USFWS announced this DPS is a recovered population, no longer meeting the ESA's definition of threatened or endangered, and consequently, the USFWS proposed to delist this DPS (USFWS 2005c). The Yellowstone grizzly bear DPS increased from estimates as low as 136 individuals when listed in 1975 to more than 580 animals as of 2004. The population has been increasing since the mid 1990s and is increasing at 4 to 7 percent per year. The range of this population also has increased dramatically as evidenced by the 48-percent increase in occupied habitat since the 1970s (USFWS 2005c).

None of the areas that may potentially be developed for CBNG occur within the Yellowstone grizzly bear recovery zone, and approximately 550 acres of BLM-administered coal or oil/gas/coal estate occur within occupied grizzly bear habitat outside the recovery zone (Map 2).

4.1.4.4 Potential Impact

Roads and the presence of humans would increase the risk of human-bear interactions, which occasionally end in the death of the grizzly bear. The increase in density of roads in occupied grizzly bear areas could force the bears from these areas and could increase stress on the bears, resulting in the potential loss or reduced fecundity of some individuals.

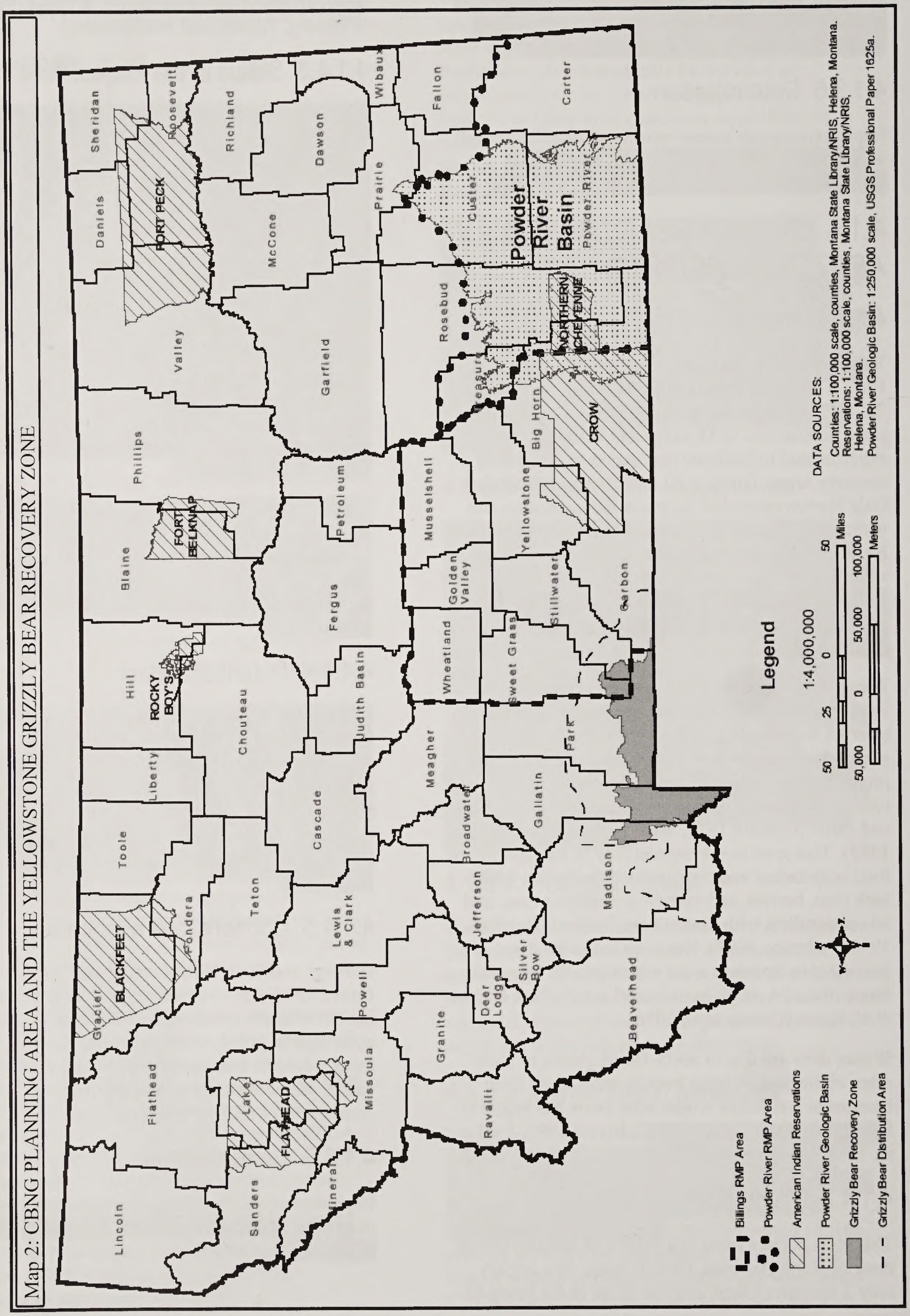
4.1.4.5 Conservation Measures

Garbage and other human refuse will be removed from drilling and construction sites in potential bear habitat to avoid attracting bears. Surveys for scat and other sign of grizzly bears in remote, sparsely roaded areas would be conducted prior to construction. If found, protocol would be established after consultation with USFWS biologists.

4.1.4.6 Determination

Implementation of conservation measures will result in a "may affect, not likely to adversely affect" situation for grizzly bears.

Map 2: CBNG PLANNING AREA AND THE YELLOWSTONE GRIZZLY BEAR RECOVERY ZONE



4.2 Birds

4.2.1 BALD EAGLE (*HALIAEETUS LEUCOCEPHALUS*)

4.2.1.1 Habitat

This species was reclassified from endangered to threatened, because of recovery status, on July 12, 1995. Due to continued recovery and increase in population size, the USFWS proposed the bald eagle be delisted (USFWS 1999).

Bald eagles concentrate in and around areas of open water where waterfowl and fish are available. They prefer solitude; late-successional forests; shorelines adjacent to open water; a large prey base for successful brood rearing; and large, mature tree for nesting and resting (Fisher et al. 1998).

4.2.1.2 Distribution

The bald eagle ranges throughout much of North America, nesting on both coasts from Florida to Baja California, Mexico in the south, and from Labrador to the western Aleutian Islands, Alaska in the north. An estimated one-quarter to one-half million bald eagles lived on the North American continent before the first Europeans arrived. Nationwide bald eagle surveys, conducted in 1973 and 1974 by the USFWS, other cooperating agencies, and conservation organizations, revealed that the eagle population throughout the lower 48 states was declining. A partial survey conducted by the National Audubon Society in 1963 reported on 417 active nests in the lower 48 states, with an average of 0.59 young produced per nest. Surveys coordinated by USFWS in 1974 resulted in a population estimate of 791 occupied breeding areas for the lower 48 states. The USFWS estimated that the breeding population exceeded 5,748 occupied breeding areas in 1998. The bald eagle population has essentially doubled every 7 to 8 years during the past 30 years.

4.2.1.3 Status in the Project Area

Bald eagles nest along all the major rivers within the project area. These watersheds provide important habitat during spring and fall migrations, as well as during the winter months. Bald eagles have been expanding their nesting territories throughout south-central and southeastern Montana (Flath 1991).

4.2.1.4 Project Impact

Bald eagles are sensitive to human presence. Disturbance to foraging, resting, roosting, or migrating eagles is possible through surface use in other areas not addressed by stipulations. Stipulations listed in the introduction of the Wildlife section (Chapter 4 Wildlife) in the Powder River and Billings Amendment to the RMPs and SEIS, including no surface use or occupancy within 0.5 mile of nests active in the last 7 years and within riparian area nesting habitat. It is assumed these stipulations would prevent eagles from abandoning traditional nesting sites in the project area, but periodic or complete abandonment of non-nesting habitat may occur depending on the level of human use and noise. Removal of large trees in wintering areas, particularly at established roost sites, could also displace bald eagles by removing perch and roost sites.

Regarding oil and gas infrastructure, above-ground transmission facilities will not likely result in the death of bald eagles from electrocution because of proper design and construction requirements. Utility lines and motor vehicles do however pose strike hazards for bald eagles, especially near perennial rivers and water bodies that support fish and waterfowl. For powerlines, the operator will demonstrate in the Project POD how the proposal for power distribution would mitigate or minimize impacts to affected wildlife. For example, the operator may propose that all or a portion of the powerlines be buried and any aboveground lines be designed following raptor-safe specifications. Additionally, for each proposed CBNG development, operators will document in the Project POD the surface owner consultation process and input received for the location of roads, pipelines, and utility line routes.

4.2.1.5 Conservation Measures

Prior to CBNG development or construction, a wildlife biologist will survey the construction zone within a 1.0-mile width for bald eagles and bald eagle nests. Surface occupancy and use will be prohibited within 0.5 mile of any identified nest or riparian nesting habitat. Surveys for bald eagle winter roost sites will be conducted during winter/spring along wooded riparian corridors within 1.0 mile of proposed CBNG development. Surface occupancy will be prohibited within 0.5 mile of any identified bald eagle roost site. Specifications to minimize the effects of roads, pipelines, and utility line routes on bald eagles are described in Section 4.2.1.4.

4.2.1.6 Determination

Implementation of the conservation measures will result in "may affect, not likely to adversely affect" situation for bald eagles.

4.2.2 INTERIOR LEAST TERN (*STERNA ANTILLARUM ATHALASSOS*)

4.2.2.1 Habitat

This species was listed as endangered on May 28, 1985.

The occurrence of breeding least terns is localized and depends upon the presence of dry, exposed sand bars and favorable river flows that support desired forage fish and that also isolate the sand bars from the river banks. Characteristic riverine nesting sites are dry, flat, sparsely vegetated sand and gravel bars within a wide, unobstructed, water-filled river channel (Ziewitz et al. 1992). The sand at a nesting site must be mostly clear of vegetation, and water levels low enough for nests to remain dry. Nests are initiated only after spring and early summer flows recede and dry areas on sand bars are exposed, usually on higher elevations away from the water's edge. Artificially created nesting sites, such as sand and gravel pits, dredge islands, reservoir shorelines and power plant ash disposal areas, also are used occasionally as well (Kirsch 1996).

4.2.2.2 Distribution

The interior least tern is migratory and historically bred along the Mississippi, Red, and Rio Grande River systems and rivers of central Texas. The breeding range extended from Texas to Montana and from eastern Colorado and New Mexico to southern Indiana. It included the Red, Missouri, Arkansas, Mississippi, Ohio, and Rio Grande river systems. The interior least tern continues to breed in most of the aforementioned river systems, although its distribution generally is restricted to less altered river segments (USFWS 2006a).

4.2.2.3 Status in the Project Area

The least tern is known to nest in the project area and also occasionally may pass through the area during spring and fall migration. Its habitat in the project area includes graveled islands in the lower Yellowstone River (Fisher et al. 1998).

4.2.2.4 Project Impact

This species is susceptible to disturbance during the nesting period. It is highly vulnerable to changes in water levels during the nesting period.

4.2.2.5 Conservation Measures

Potential habitat near drilling and construction sites will be identified and appropriate surveys will be conducted for this species. Surface occupancy and use will be prohibited within 0.25 mile of wetlands identified as providing interior least tern nesting habitat. Occupied wetlands and water levels will be protected in all phases of drilling and construction and no discharge into occupied wetlands will be permitted.

4.2.2.6 Determination

With strict adherence to survey protocols, stipulations and conservation measures, the proposed action will have "no effect" on interior least terns.

4.2.3 WHOOPING CRANE (*GRUS AMERICANA*)

4.2.3.1 Habitat

The whooping crane was first listed as endangered on March 11, 1967, and the listing was "grandfathered" into the ESA. Whooping cranes nest in marshy areas among bulrushes, cattails, and sedges that provide protection from predators as well as food (USFWS 2006b). During the nesting season, the birds feed and roost in wetlands and upland grain fields, where they associate with ducks, geese, and sandhill cranes. Whooping cranes use a variety of habitats during migration, including croplands for feeding and large palustrine (marshy) wetlands and riverine habitats for roosting. About 9,000 hectares of salt flats in the Aransas National Wildlife Refuge (NWR) and adjacent islands comprise the principal winter grounds.

4.2.3.2 Distribution

Wild populations of whooping cranes utilize the Texas Gulf coast, including Aransas NWR, Texas, and Bosque del Apache NWR, New Mexico, and migration and staging areas through northeastern Montana, the western half of North Dakota, central South Dakota, Nebraska, Oklahoma, and east-central Texas (USFWS 2006b). In addition, a non-migratory whooping crane population resides in Florida (USFWS 2006b). For the past 20 years, observations

in Montana have been restricted to the northeast corner of the state (MFWP 2006). The birds observed in this area represent occasional migrants traveling through from the Aransas population on journey to the breeding grounds in Alberta and the Northwest Territories. As of January 2005, the wild population of whooping cranes was estimated at approximately 300 individuals (USFWS 2005d).

4.2.3.3 Status in the Project Area

Whooping cranes have not been sighted within the project area within the past 20 years (MFWP 2006). Any birds that may use the area would only occur as transients passing through the area during migration.

4.2.3.4 Project Impact

Whooping cranes are very occasional migrants in southeast and south central Montana, and there are no known stop-over habitats within the project area. As migrants, whooping cranes would only be affected by very tall structures, such as large transmission lines and towers, communication towers and guy-wires, and similar structures which represent potentials for in-flight collisions. There are no such tall structures proposed in this project.

4.2.3.5 Conservation Measures

There are no ancillary structures and facilities proposed in the project area which would present a potential for in-flight collision for whooping cranes. The on-site electric distribution lines are all relatively low, and many lines will be buried to further reduce the potential for collision.

4.2.3.6 Determination

Implementation of the conservation measures would result in "no effect" to whooping cranes.

4.3 Fish

4.3.1 PALLID STURGEON (*SCAPHIRHYNCHUS ALBUS*)

4.3.1.1 Habitat

This species was listed as endangered on September 6, 1990 (55 FR 36641). They are found in large rivers with high turbidity and a natural flow with rocky or sandy substrates (Forbes and Richardson 1905). They evolved in large rivers with high turbidity and a natural hydrograph that included spring flooding and other high runoff events. Preferred habitat has a diversity of depths and velocities formed by braided channels, sandbars, islands, sand flats and gravel bars (Erickson 1992, Gilbraith et al. 1988). Pallid sturgeon are usually found now in deeper holes below sandbars and in riverine reaches of reservoirs (Kallemeyn 1983, Erickson 1992, Clancey 1991).

4.3.1.2 Distribution

Historically, pallid sturgeon were found in the Missouri River from Fort Benton, Montana, to St. Louis, Missouri; in the Mississippi River from above St. Louis to the Gulf of Mexico; in the lower reaches of other large tributaries, such as the Yellowstone, Platte, Kansas, Ohio, Arkansas, Red, and Sunflower Rivers; and in the first 60 miles of the Atchafalaya River (Bailey and Cross 1954, Kallemeyn 1983).

4.3.1.3 Status in the Project Area

Historically in Montana, pallid sturgeon occupied reaches of the Missouri River from Fort Benton downstream and in the Yellowstone River from about Forsyth (river mile 183) to the Missouri River (USFWS 1993, Montana Natural Resource Information System 2005). Natural water flow and natural flooding events have been changed by channel developments and hydroelectric projects. These changes, coupled with pollution and fishing, are believed to be the main reason for the decline in this species. There are two pallid sturgeon recovery priority management areas (RPMAs) in Montana, with one (RPMA 1) located upstream of Fort Peck Dam on the Missouri River, and the other (RPMA 2) including the Missouri River reach downstream of Fort Peck Dam and the lower Yellowstone River (upstream to the mouth of the Tongue River). Thus, portions of the Project Area occur in RPMA 2. While the lower Yellowstone River is believed to support relatively high survival of hatchery-reared pallid sturgeon, no known recruitment has occurred in the Yellowstone River for at least 30 years. Thus this species will likely be extirpated from this area by 2018 (Jaeger et al. 2005).

4.3.1.4 Project Impact

There could be minimal, temporary effects through construction of stream crossings and erosion generated by construction activities. The proposed action contains requirements designed to protect hydrologic resources by combining management options of CBNG-produced water so that no degradation of water quality would be allowed in any watershed. CBNG operators would be required to develop a Water Management Plan as part of their

overall Project POD that describes how impacts on surface resources would be minimized or mitigated, and how a discharge (if proposed by the operator) could occur without damaging the watershed—in accordance with a required and approved NPDES Permit and water quality laws. Stipulations prohibiting surface occupancy or use of water bodies, floodplains of major rivers, riparian areas, and steep slopes would further avoid impacts. These measures would avoid water quality impacts to the pallid sturgeon. In addition, release of adequate quality water from production may improve habitat that has been degraded through water withdrawals.

The Water Management Plans would also establish site-specific thresholds for the volume of untreated produced water that could be discharged to surface waters from federal CBNG wells. These requirements would be in addition to the surface water quality and discharge volume limitations stipulated in the Montana Pollutant Discharge Elimination System (MPDES) discharge process. The total allowable untreated discharge volume would be based on 10 percent of the 7Q10 flow rate, unless specific surface water quality monitoring is conducted upstream and downstream of the particular outfall. If monitoring indicates that water quality thresholds would be exceeded, no further untreated discharge would be allowed, regardless of the total discharge volume to the water body. MDPES water quality and quantity monitoring data and reports are available on the Montana BLM CBNG monitoring website (http://www.blm.gov/mt/fo/miles_city_field_office/cbng/monitoring.html).

Long-term effects on pallid sturgeon associated with discontinued activities, such as sediment delivery from roads, would subside as disturbed areas are reclaimed. Agency mitigation measures implemented during abandonment would reduce erosion potential, prevent water pollution, facilitate reclamation of disturbed lands, and further reduce the potential for long-term impacts on pallid sturgeon.

4.3.1.5 Conservation Measures

There are no specific conservation measures identified; however, the BLM will develop, include, and enforce appropriate mitigation measures for aquatic resources, including pallid sturgeon, during the site-specific, plan-approval stage. Measures to further avoid or reduce impacts in addition to those included at the plan-approval stage may be recommended. The state will apply additional mitigation measures on a case-by-case basis through the use of field rules.

4.3.1.6 Determination

If conservation measures are implemented, this project "may affect but is not likely to adversely affect" pallid sturgeon.

4.3.2 MONTANA ARCTIC GRAYLING (*THYMALLUS ARCTICUS* Montanus)

4.3.2.1 Habitat

This species is currently a candidate for listing under the ESA. On October 2, 1991, a petition requested that the "fluvial Arctic grayling" be listed as an endangered species throughout its historic range in the lower 48 states. The petitioners stated that the decline of the fluvial Arctic grayling was a result of many factors, including habitat degradation from domestic livestock grazing and stream diversions for irrigation, competition with non-native trout species, and past over-harvesting by anglers. Additionally, the petition stated that much of the annual recruitment is lost in irrigation ditches.

4.3.2.2 Distribution

Historically, the fluvial Arctic grayling DPS occurred throughout the streams and rivers of the upper Missouri River drainage, above Great Falls Montana (USFWS 2005e). However, the current distribution is estimated to represent about 5 percent of this historic range. While the lake-dwelling form is fairly common in 30 or more lakes across the western half of the state, the native fluvial or river-dwelling population is believed restricted to the upper Big Hole River.

4.3.2.3 Status in the Project Area

In Montana, Arctic grayling are generally found at relatively high and cold headwater locations. Within the project area these locations include headwaters in the Clarks Fork of the Yellowstone River. However, studies by the MFWP show that the relative abundance of grayling in this area is "rare" (Montana Natural Resource Information System 2005).

4.3.2.4 Project Impact

There could be minimal, temporary effects through construction of stream crossings and erosion generated by construction activities. The proposed action contains requirements designed to protect hydrologic resources by combining management

options of CBNG-produced water so that no degradation of water quality would be allowed in any watershed. CBNG operators would be required to develop a Water Management Plan as part of their overall Project POD that describes how impacts on surface resources would be minimized or mitigated, and how a discharge (if proposed by the operator) could occur without damaging the watershed—in accordance with a required and approved NPDES Permit and water quality laws. Stipulations prohibiting surface occupancy or use of water bodies, floodplains, riparian areas, and steep slopes would further avoid impacts. These measures would avoid water quality impacts to the Arctic grayling. In addition, release of adequate quality water from production may improve habitat that has been degraded through water withdrawals.

The Water Management Plans would also establish site-specific thresholds for the volume of untreated produced water that could be discharged to surface waters from federal CBNG wells. These requirements would be in addition to the surface water quality and discharge volume limitations stipulated in the MPDES discharge process. The total allowable untreated discharge volume would be based on 10 percent of the 7Q10 flow rate, unless specific surface water quality monitoring is conducted upstream and downstream of the particular outfall. If monitoring indicates that water quality thresholds would be exceeded, no further untreated discharge would be allowed, regardless of the total discharge volume to the water body. MPDES water quality and quantity monitoring data and reports are available on the Montana BLM CBNG monitoring website (http://www.blm.gov/mt/fo/miles_city_field_office/cbng/monitoring.html).

Long-term effects on Arctic grayling associated with discontinued activities, such as sediment delivery from roads, would subside as disturbed areas are reclaimed. Agency mitigation measures implemented during abandonment would reduce erosion potential, prevent water pollution, facilitate reclamation of disturbed lands, and further reduce the potential for long-term impacts on Arctic grayling.

4.3.2.5 Conservation Measures

There are no specific conservation measures identified; however, the BLM will develop, include, and enforce appropriate mitigation measures for aquatic resources, including Arctic grayling, during the site-specific, plan-approval stage. Measures to further avoid or reduce impacts in addition to those included at the plan-approval stage may be recommended. The state will apply additional mitigation measures on a case-by-case basis through the use of field rules.

4.3.2.6 Determination

As this species is not expected to occupy areas where CBNG activities are likely to occur, along with the implementation of appropriate best management practices (BMPs) and conservation measures, the proposed action is not "likely to significantly affect Arctic grayling populations, individuals, or their suitable habitat."

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Attachment A

Correspondence with USFWS

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Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

411 108th AVENUE NE, SUITE 1800
BELLEVUE, WA 98004-5571
T. 425 . 458 . 6200 F. 425 . 458 . 6363
www.parametrix.com

September 15, 2005

R. Mark Wilson
Field Supervisor
USFWS – Ecological Services
100 North Park, Suite 320
Helena, Montana 59601

Re: BLM project notification and request for species

Dear Mr. Wilson:

The Bureau of Land Management (BLM), Miles City Field Office, is preparing a Supplemental Environmental Impact Statement (SEIS) for the Montana Statewide Oil and Gas EIS and Amendment of the Powder River and Billings Resource Management Plans. Parametrix, Inc. is a contractor for this project.

This letter is to request an updated list of threatened and endangered species, pursuant to Section 7 of the Endangered Species Act (ESA), that should be addressed in the Biological Assessment associated with this SEIS. The planning area for SEIS is located in southeastern and south-central Montana, including Powder River, Treasure, Carbon, Golden Valley, Musselshell, Stillwater, Sweet Grass, Wheatland, Yellowstone, and Big Horn counties, as well as portions of Carter, Custer, and Rosebud counties. A figure indicating the SEIS planning area is attached.

If you have any questions, please contact me at 509-996-2402 or jgrialou@parametrix.com.

Thank you,

Julie Grialou
Wildlife Biologist
Parametrix

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United States Department of the Interior
FISH AND WILDLIFE SERVICE

ECOLOGICAL SERVICES
MONTANA FIELD OFFICE
100 N. PARK, SUITE 320
HELENA, MONTANA 59601
PHONE (406) 449-5225, FAX (406) 449-5339

M.02 BLM Coal Bed Methane November 4, 2005

Ms. Julie Grialou
Wildlife Biologist
Parametrix
411 108th Avenue NE, Suite 1800
Bellevue, WA 98004-5571

Dear Ms: Grialou:

This responds to your letter received in the Billings Sub Office on September 23, 2005, requesting an updated species list for the preparation of a Biological Assessment. The Bureau of Land Management (BLM), Miles City Field Office, is preparing a Supplemental Environmental Impact Statement (SEIS) for the Montana Statewide Oil and Gas EIS and Amendment of the Powder River and Billings Resource Management Plans.

The planning area for the SEIS is located in southeastern and south-central Montana, including Treasure, Powder River, Wheatland, Golden Valley, Musselshell, Sweet Grass, Stillwater, Yellowstone, Big Horn, Carbon Counties, as well as portions of Carter, Custer, and Rosebud counties.

In accordance with section 7(c) of the Endangered Species Act of 1973, as amended (Act), my staff has determined that the following threatened or endangered species, or species proposed for listing under the Act, may be present in the project area.

Listed Species	**Status**	**Expected occurrence**
Black-footed Ferret (*Mustela nigripes*)	E/XN	Prairie dog complexes; Eastern Montana
Gray Wolf (*Canis lupus*)	T/XN	Forests; Western Montana
Grizzly Bear (*Ursus arctos horribilis*)	T	Alpine/subalpine coniferous forest; western Montana

Canada Lynx (*Lynx canadensis*)	T	Montane spruce/fir forest; western Montana
Whooping Crane (*Grus Americana*)	E	Wetlands, croplands; transient statewide
Least Tern (*Sterna antillarum*)	E	Yellowstone, Missouri River sandbars, beaches; Eastern Montana
Pallid Sturgeon (*Scaphirhynchus albus*)	E	Bottom dwelling; Missouri, Yellowstone Rivers
Bald Eagle (*Haliaeetus leucocephalus*)	T	Forested riparian; statewide

Pursuant to Section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.), the BLM, as the responsible Federal agency, must determine if the proposed actions may affect these listed species and if so, initiate formal consultation with the Fish and Wildlife Service (Service). Guidance for preparation of a biological assessment for the *2002 Montana Statewide Draft Oil and Gas Environmental Impact Statement (EIS) and Amendment of the Powder River and Billings Resource Management Plans* (RMPs), was provided to the BLM by the Service in a letter dated April 2001. Comments on the Draft Oil and Gas Environmental Impact Statement (DEIS) were provided to the BLM's Miles City office in a memorandum dated May 15, 2002.

We also recommend that Parametrix utilize information and data gathered by federal and state agencies that comprise the Powder River Basin Coal Bed Natural Gas Interagency Working Group and Task Groups; and monitoring through the implementation of a *Coal Bed Methane Programmatic Wildlife Monitoring and Protection Plan for the Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans* (Wildlife Monitoring Protection Plan) in determining the impacts of the BLM's action on listed and proposed species. The new determination should include possible downstream effects on the pallid sturgeon and least tern.

The Service also advocates that the BLM considers a spatio-temporal based alternative in its analysis of the effects of coal bed methane production on listed and proposed species as outlined in comments made by our biologist involved the DEIS development process. A spatio-temporal alternative would open some area for development and production while leaving other areas free from production until reclamation activities have been completed on earlier phases.

The effects of high-intensity Coal Bed Methane (CBM) development on fish and wildlife resources are largely unknown, but are suspected to reduce the utility of habitat for some species, including listed species and those on the BLM sensitive species list. Species will vary in their

reaction to development, but it will affect how species utilize the landscape. There are currently ongoing studies in Wyoming and Montana that address questions about the effects of CBM development on a variety of species. When these studies are completed, we will have a better foundation on which to base conservation measures in planning this development, until then, it seems prudent to analyze a range of alternatives that includes one based on spatio-temporal phasing as a conservative approach that will have conservation benefits for species for which little in known.

If you have any questions regarding this letter, please contact Lou Hanebury at (406) 247-7367 or Shawn Sartorius at (406) 247-7369 in our Billings Sub Office. We appreciate your efforts to consider endangered species in your project planning.

Sincerely,

R. Mark Wilson

R. Mark Wilson
Field Supervisor
Montana Field Office

cc: USFWS, SO, MT (Attn: Lou Hanebury)
USFWS, FO, WY (Attn: Brad Rogers)
BLM, Miles City Office, MT (Larry Apple)

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Miles City Field Office
111 Garryowen Road
Miles City, Montana 59301
http://www.mt.blm.gov/mcfo

1310 CBMP

November 20, 2006

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

R. Mark Wilson
Field Supervisor
USFWS - Ecological Services
100 North Park, Suite 320
Helena, Montana 59601

Dear Mr. Wilson:

The Bureau of Land Management (BLM), Miles City and Billings Field Offices have prepared the "*Supplement to the Final Montana Statewide Oil and Gas Environmental Impact Statement and Amendment of the Powder River and Billings Resource Management Plans*" (SEIS). The SEIS primarily addresses alternatives for phased coal bed natural gas development in southeastern and south-central Montana. A copy has been enclosed for your review.

Pursuant to BLM's responsibility under Section 7 of the Endangered Species Act of 1973, and in accordance with the Code of Federal Regulations 50 Part 407.12, we are forwarding a copy of the "Biological Assessment for Coal Bed Natural Gas Production in Montana" for your 90-day review.

Shaded areas in the Biological Assessment indicate changes and additions made as a result of supplementing the original EIS. We have found that there would be "no effect" to Canada lynx, gray wolf, grizzly bear, interior least tern and the warm spring zaitzevian riffle beetle. We have also determined a "may effect, but not likely to adversely impact" finding for the Ute ladies-tresses orchid, black-footed ferret, mountain plover, bald eagle, pallid sturgeon and Montana arctic grayling. The black-tailed prairie dog and sage-grouse are discussed but no finding is made as they are not threatened, endangered or candidate species.

Please respond whether or not you concur with the findings of the Biological Assessment. If changes are made between the Draft SEIS and the Final SEIS that would have an effect on threatened or endangered species other than those described in the draft, the BLM will reinitiate consultation with you.

We appreciate the input already provided to us by Shawn Sartorius and look forward to working with you and your staff to complete consultation for this plan.

Please contact Dale Tribby, Assistant Field Manager, Renewable Resources, in the Miles City Field Office at (406) 233-2812 if you have any questions. Thank you for your assistance.

Sincerely,

Theresa M. Hanley

Theresa M. Hanley
Field Manager

2 Enclosures
1-Draft SEIS
2-Biological Assessment

cc: Jay Parks, MT010
Shawn Sartorius, USFWS

United States Department of the Interior
FISH AND WILDLIFE SERVICE

ECOLOGICAL SERVICES
MONTANA FIELD OFFICE
585 SHEPARD WAY
HELENA, MONTANA 59601
PHONE (406) 449-5225, FAX (406) 449-5339

M.02 - BLM

March 25, 2007

Memorandum

To: Field Manager, Bureau of Land Management, Miles City Field Office, Miles City, Montana

From: Field Supervisor, U.S. Fish and Wildlife Service, Montana Field Office, Helena, Montana R. Mark Wilson

Subject: Service concurrence on *Supplement to the Final Montana Statewide Oil and Gas Environmental Impact Statement and amendment to the Powder River and Billings Resource Management Plans*

This is in response to your March 2, 2007 letter transmitting the biological assessment for the *Supplement to the Final Montana Statewide Oil and Gas Environmental Impact Statement and amendment to the Powder River and Billings Resource Management Plans* (SEIS) for the Miles City and Billings Bureau of Land Management (BLM) Field Offices. The proposal would permit coal bed methane gas extraction from federally owned coal seams within the boundaries of the two field offices. The assessment analyzed effects to the threatened grizzly bear (*Ursus arctos*), Canada lynx (*Lynx canadensis*), bald eagle (*Haliaeetus leucocephalus*), endangered pallid sturgeon (*Scaphirhynchus albus*), gray wolf (*Canis lupus*), whooping crane (*Grus Americana*), black-footed ferret (*Mustela nigripes*), and least tern (*Sternula antillarum*). In your assessment you determined that the proposed action would have no effect on the whooping crane and would not be likely to jeopardize the experimental/non-essential population of the gray wolf. When BLM makes a no effect determination or a no jeopardy determination in the case of a designated experimental/non-essential population, concurrence from the U.S. Fish and Wildlife Service (Service) is not required, although we do appreciate inclusion of the information for our records.

The Service concurs with your determination that the proposed action may affect, but is not likely to adversely affect the grizzly bear, bald eagle, pallid sturgeon, black-footed ferret, least tern, and Canada lynx. Formal consultation is not required at this time.

This concludes informal consultation pursuant to regulation 50 CFR Part 402, Interagency Cooperation-Endangered Species Act of 1973, as Amended. This project should be reanalyzed if new information reveals effects of the action that were not analyzed in the biological assessment that may impact listed species or if the project is modified in a manner that causes an effect not considered in this consultation.

The Service recognizes and values the ongoing efforts by the Miles City Field Office to conserve native species and move threatened and endangered species toward recovery.

If you have further questions about this letter or your responsibilities under the Endangered Species Act, please contact me or Shawn Sartorius of my staff at 406-247-7369.

GLOSSARY
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MONTANA

GLOSSARY

7Q10. A statistical measure for the lowest flow expected for a continuous 7-day period in 10 years.

ABANDON. To cease producing gas from a well when it becomes unprofitable. A wildcat (exploration) well may be abandoned after it has been proven nonproductive. Usually, some of the casing is removed and salvaged, and one or more cement plugs placed in the borehole to prevent migration of fluids between formations.

ABNORMAL PRESSURE. Pressure exerted by a formation and exceeding or falling below the normal pressure to be expected at a given depth. Normal pressure increases approximately 0.433 psi per foot of depth. Formations with abnormally high pressure must be controlled to prevent a blowout.

ACID NEUTRALIZING CAPACITY. The extent to which natural water bodies are able to buffer atmospheric deposition of sulfate and/or nitrate particulate matter from air pollution emission sources.

ACRE-FOOT. A term used in measuring the volume of fluid. An acre-foot is the amount of fluid required to cover 1 acre to a depth of 1 foot, or 43,560 cubic feet (325,829 gallons).

AIR QUALITY. Air quality is based on the amount of pollutants emitted into the atmosphere and the dispersion potential of an area to dilute those pollutants.

ALKALINITY. The quantity and kinds of compounds present in water that collectively shift the pH to the alkaline side of neutrality. See **salinity**.

ALLOTMENT CATEGORIZATION. The grouping of livestock grazing allotments into the categories "M" (maintain current satisfactory condition), "I" (improve current unsatisfactory condition), and "C" (manage custodially while protecting existing resource values).

ALLUVIUM. General term for debris deposited by streams on river beds, floodplains, and alluvial fans, especially deposits brought down during a flood. Applies to stream deposits of recent time. Does not include below water sediments of seas and lakes.

ANIMAL UNIT. A standardized unit of measurement for range livestock or wildlife. Generally, one mature cow, one horse, five sheep, 9.6 antelope, 5.8 deer, or 1.9 elk, based on an average forage consumption of 26 pounds of dry matter per day.

ANIMAL UNIT MONTH. A standardized unit of measurement of the amount of forage necessary for the complete sustenance of one animal for one month; also, the measurement of the privilege of grazing one animal for one month.

ANNULUS OR ANNULAR SPACE. The space around a pipe in a wellbore, the outer wall of which may be the wall of either the borehole or the casing.

ANTICLINE. An arched, inverted-trough configuration of folded and stratified rock layers.

AQUIFER. A body of rock that is sufficiently permeable to conduct groundwater and to yield economically significant quantities of water to wells and springs.

APPLICATION FOR PERMIT TO DRILL, DEEPEN OR PLUG BACK (APD). The Department of Interior application permit form to authorize oil and gas drilling activities on federal land.

AREA OF CRITICAL ENVIRONMENTAL CONCERN. An area that needs special management attention to preserve historic, cultural, or scenic values; to protect fish and wildlife resources or other natural systems or processes; or to protect life and provide safety from natural hazards.

ARTESIAN. Groundwater with sufficient pressure to flow without pumping.

BANKHEAD-JONES FARM TENANT ACT OF 1937. This Act enabled the government to buy marginal farms and to put the farms back into grazing.

BASIN. A closed geologic structure in which the beds dip toward the center; the youngest rocks are at the center of a basin and are partly or completely ringed by progressively older rocks.

BEDROCK. The solid, unweathered rock underlying soils.

BEST AVAILABLE CONTROL TECHNOLOGY (BACT). The best available air pollution control technology for a given emission source, considering environmental benefits, economic and energy costs, as defined by the applicable air quality regulatory authority.

BITUMINOUS. The most abundant rank of coal (synonymous with soft coal). It is dark brown to black and burns with a smoky flame.

BLOCK MANAGEMENT. Through cooperation with the Montana Fish, Wildlife, and Parks, a Memorandum of Understanding allows the BLM, the private landowners, and Montana Fish, Wildlife, and Parks to close off some public lands administered by BLM in exchange for opening up private lands to hunting. This is done on a rotating basis from year to year.

BLOOEY PIT. The pit that receives cuttings and other discharges from a well drilled with air.

BLOWOUT. An uncontrolled expulsion of gas, oil, or other fluids from a drilling well. A blowout, or "gusher," occurs when formation pressure exceeds the pressure applied to it by the column of drilling fluid and when blowout prevention equipment is absent or fails.

BLOWOUT PREVENTER. Equipment installed at the well head to prevent the escape of pressure either from the annular space between the casing and drill pipe or from an open hole during drilling and completion operations.

BRACKISH WATER. Water that contains relatively moderate concentrations of any soluble salts. Brackish water is saltier than fresh water but not as salty as salt water or brine water.

BRINE. Water containing relatively large concentrations of dissolved salts, particularly sodium chloride. Brine has higher salt concentrations than ordinary ocean water.

BRINE PIT. An excavated pit used to hold brine produced from a well.

BROWSE. As a verb, to consume or to feed on (as a plant); as a noun, the tender shoots, twigs, and leaves of trees and shrubs, often used as food by cattle, antelope, deer, elk, and other animals.

BUFFER ZONE.

1. An area between two different land uses that is intended to resist, absorb or otherwise preclude developments or intrusions between the two use areas.

2. A strip of undisturbed vegetation that retards the flow of runoff water, causing deposition of transported sediment and reducing sedimentation in the receiving stream.

CANOPY COVER. The percentage of ground area under an overstory vegetation that would not be impacted by raindrops falling straight down.

CASING. Steel pipe placed in a gas well to prevent the hole from caving.

CHANNEL INTEGRITY (STABILITY). A relative term describing erosion or movement of the channel walls or bottom because of water flow.

CHECKERBOARD PATTERN. One in which ownership of sections of land alternates between federal and other ownership, usually private. On a map with different colors denoting type of ownership, the pattern resembles a checkerboard.

CLAYEY. A soil containing more than 35 percent clay. The textural classes are sandy clay, silty clay, clay, clay loam, and silty clay loam.

CLEAN AIR ACT. Public Law 84-159, established July 14, 1955, and amended numerous times since. The Clean Air Act: establishes federal standards for air pollutants emitted from stationary and mobile sources; authorizes states, tribes and local agencies to regulate polluting emissions; requires those agencies to improve air quality in areas of the country which do not meet federal standards; and to prevent significant deterioration in areas where air quality is cleaner than those standards. The Act also requires that all federal activities (either direct or authorized) comply with applicable local, state, tribal and federal air quality laws, statutes, regulations, standards and implementation plans. In addition, before these activities can take place in non-attainment or maintenance areas, the federal agencies must conduct a Conformity Analysis (and possible Determination) demonstrating the proposed activity will comply with all applicable air quality requirements.

CLOSED MUD SYSTEM. A drill mud system that reuses or reclaims all the drilling fluid used. Oil-based mud systems are often closed mud systems.

COAL BED NATURAL GAS. A clean-burning natural gas found deep inside and around coal seams. The gas has an affinity to coal and is held in place by pressure from groundwater. Mining for coalbed methane involves drilling into coal seams and discharging large volumes of groundwater to release the gas.

COLLUVIAL. Loose, incoherent geological deposits at the bottom of a slope or cliff, having fallen from above.

COMMUNITIZATION. The pooling of mineral acreages based on the spacing for a well or wells set by the state or BLM.

COMPACTION. The process of packing firmly and closely together; the state of being so packed; for example, mechanical compaction of soil by livestock or vehicular activity. Soil compaction results from particles being pressed together so that the volume of the soil is reduced. It is influenced by the physical properties of the soil, moisture content, and the type and amount of compactive effort.

COMPLETION. The activities and methods to prepare a well for production. Includes installation of equipment for production from a gas well.

CONDITION OF APPROVAL (COA). Conditions or provisions (requirements) under which an Application for a Permit to Drill or a Sundry Notice is approved.

CONTINENTAL DEPOSITS. A sedimentary deposit laid down on land (whether a true continent or only an island) or in bodies of water (whether fresh or saline) not directly connected with the ocean, as opposed to a marine deposit; a glacial, stream, lake, or windborne deposit formed in a nonmarine environment.

CONTROLLED SURFACE USE (CSU). Use or occupancy is allowed (unless restricted by another stipulation), but identified resource values require special operational constraints that may modify the lease rights. CSU is used for operating guidance, not as a substitute for the NSO or Timing stipulations.

CONVEYANCE LOSS. The percentage reduction in water volume between the time it is discharged to the surface and the time it reaches a perennial stream. This reduction in volume is due to the processes of infiltration and evaporation.

CORRIDOR. A strip of land through which one or more existing or potential facilities may be located.

CROW RESERVATION. The Crow Reservation as established by the September 17, 1851 Ft. Laramie Treaty and by federal statues and case law.

CRUCIAL WINTER RANGE. That portion of the winter range on which a wildlife species is dependent for survival during periods of heaviest snow cover.

CULTURAL RESOURCE. A term that includes items of historical, archaeological, or architectural items; a remnant of human activity.

CUMULATIVE IMPACT. The impact on the environment that results from the positive or negative impacts of an action when added to other past, present, and reasonable foreseeable future actions, regardless of what agency or person performed such action(s).

DANCING GROUNDS. An area used in the spring by sharp-tailed grouse for courtship displays and breeding.

DECIBEL OR dB. A unit for measuring sound intensity, usually measured on the decibel A weighted scale (dBA) which approximates the sound levels heard by the human ear at moderate sound levels.

DECIVEW OR dV. A visual index appropriate for characterizing visibility through uniform hazes, designed to be linear with respect to perceived visual changes over its entire range (from pristine to polluted conditions) in a way that is analogous to the decibel scale for sound. The deciview haze index is calculated based on the logarithmic distribution of the extinction coefficient, where a 10.0 deciview change is about a 10 percent change in extinction coefficient; a small but perceptible scenic change under many circumstances ("just noticeable change").

DEEPER COAL SEAM. Designates a coal seam that is deep enough that it can be drilled to at a directional angle from a well pad in one spacing unit to another spacing unit. This avoids the need for constructing additional roads and well pads. The exact depth that the term "deeper" applies to is relative and will vary according to field spacing requirements and local geology.

DEVELOPMENT WELL. A well drilled in proven territory (usually within 1 mile of an existing well).

DISPOSAL WELL. A well into which produced water from other wells is injected into an underground formation for disposal.

DRAINAGE (GEOMORPHIC). A collective term for all the water bodies by which a region is drained; or, all the water features shown on a map.

DRAINAGE (OIL AND GAS). The uncompensated loss of hydrocarbons from Federal, Indian tribal or Indian-allotted mineral lands from wells on adjacent non-jurisdictional lands or jurisdictional lands with lower participation, allocation, royalty rate, or distribution of funds, resulting in revenue losses to the Federal or Indian lessors.

DRILL DIRECTIONALLY. The technique of drilling at an angle from a location at the surface to a different subsurface location at a specific target depth. The degree of angle that a well can be drilled is limited, which is why this technique is not employed for shallow coal seams.

DRILL RIG. The mast, drawworks, and attendant surface equipment of a drilling or workover unit.

DRILL STEM TEST. The use of a drill-stem testing tool to test a formations potential productivity. The tool is lowered to the formation and is packed off from the above formations. The tool is then operated to sample the formation and the results recorded. Also, called a formation test.

DROP STRUCTURE. An in-stream structure of various materials designed to reduce the energy and force of stream flow.

DRY HOLE. Any well incapable of producing oil or gas in commercial quantities. A dry hole may produce water, gas or even oil, but not enough to justify production.

ECOLOGICAL CONDITION. The present state of vegetation of a site in relation to the potential natural community for the site. Ecological status is use independent. It is an expression of the relative degree to which the kinds, proportions, and amounts of plants in a plant community resemble that of the potential natural community. Four ecological status classes correspond to 0-25, 26-50, 51-75, or 76-100 percent similarity to the potential natural community and are generally called early seral, mid-seral, late seral, and potential natural community, respectively.

ECOLOGICAL SITE. A kind of land with a specific potential natural community and specific physical site characteristics, differing from other kinds of land in its ability to produce vegetation and to respond to management.

ECOSYSTEM. A biological community, together with its nonliving environment, forming an interacting system inhabiting an identifiable space.

ELECTRICAL CONDUCTIVITY. A measure of the salt content of water.

EMERGENT AQUATIC VEGETATION. An aquatic plant having part of its vegetative parts above water.

EMISSION. Air pollution discharge into the atmosphere, usually specified by mass per unit time.

ENDANGERED SPECIES. Those species of plants or animals classified by the Secretary of the Interior or the Secretary of Commerce as endangered pursuant to Section 4 of the Endangered Species Act of 1973, as amended. See also Threatened and Endangered Species.

ENHANCED RECOVERY. The use of artificial means to increase the amount of hydrocarbons that can be recovered from a reservoir. A reservoir depleted by normal extraction practices usually can be restored to production by secondary or tertiary methods of enhanced recovery.

ENTRAINED PARTICULATES. Particulates contained within auto exhaust; mainly made of carbons.

EPHEMERAL STREAM. A stream that flows only after a storm or during snowmelt, and whose channel is, at all times, above the water table.

EPOCH. An interval of time based on similar rock formations and fossil groups. Used primarily as subdivisions of the Tertiary and Quaternary Periods.

EXPLORATION. Building a two-track road to drill test wells for coalbed methane. See also **development**.

EXPLORATION WELL. A well drilled in an area where there is no oil or gas production. Same as a "wildcat" well.

FAULT. A fracture surface in rocks along which movement of rock on one side has occurred relative to rock on the other side.

FLOODPLAIN. The relatively flat area or lowlands adjoining a body of standing or flowing water that has been or might be covered by floodwater.

FLOW LINE. A small diameter pipeline through which fluids move on lease before being sold.

FORAGE. Forms of vegetation available for animal consumption.

FORB. A broad-leaved herb that is not grass or grasslike.

FORMATION (GEOLOGIC). A rock body distinguishable from other rock bodies and useful for mapping or description. Formations may be combined into groups or subdivided into members.

FRAC FLOWBACK. During the drilling process, fluid or product returns along fractures in the rock to the point where it is difficult to control; for example, flowback from a point high in the borehole or at the ground surface away from the boring.

FUGITIVE DUST. Airborne particles emitted from any source other than through a controllable stack or vent.

GABIONS. A hollow cylinder of wickerwork or strap iron constructed like a basket, filled with stones and sunk to form a bar, dike, or similar structure.

GEOMORPHIC. Pertaining to the form of the earth or its surface features.

GROUND COVER. Vegetation, mulch, litter, or rocks.

GROUNDWATER. Subsurface water that is in the zone of saturation. The top surface of the groundwater is the "water table." Source of water for wells, seepage, and springs.

GULLYING. The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from the narrow area to considerable depths, ranging from 2 feet to as much as 80 to 100 feet deep.

GULLY PLUG. Any form of material placed in an existing gully to reduce the erosional effects of moving water and thereby starting a healing process of the gully.

HABITAT. In wildlife management, the major elements of habitat are considered to be food, water, cover, and living space.

HAZARDOUS WASTE. (A) Any substance designated pursuant to section 311(b)(2)(A) of the Federal Water Pollution Control Act. (B) Any element, compound, mixture, solution, or substance designated pursuant to section 102 of this Act. (C) Any hazardous waste having the characteristics identified under or listed pursuant to section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress. (D) Any toxic pollutant listed under section 307(a) of the Federal Water Pollution Control Act. (E) Any hazardous air pollutant listed under section 112 of the Clean Air Act. (F) Any imminently hazardous chemical substance or mixture with respect to which the Administrator has taken action pursuant to section 7 of the Toxic Substances Control Act. The term does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under subparagraphs (A) through (F) of this paragraph, and the term does not include natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable for fuel (or mixtures of natural gas and such synthetic gas).

HYDROGEN SULFIDE or H_2S. A colorless, highly flammable, and very toxic gas that smells like rotten eggs at low concentrations. At higher concentrations, the sense of smell is lost, therefore becoming impossible to perceive dangerous concentrations.

INFILTRATION. The flow of a fluid into a solid substance through pores or small openings; specifically, the movement of water into soil or porous rock.

INJECTION WELL. A well used to inject fluids into an underground formation to increase reservoir pressure.

INTERMITTENT STREAM. A stream that flows most of the time but occasionally is dry or reduced to pool stage when losses from evaporation or seepage exceed the available streamflow.

LAND AND WATER CONSERVATION FUNDS. Federal revenues generated by a tax on federal off-shore oil and gas development through the Land and Water Conservation Fund Act; used to acquire highly desirable lands for the United States by the various governmental agencies.

LEASABLE MINERALS. Federal minerals subject to lease under the Mineral Leasing Act of 1920, as amended, and supplemented. Includes minerals, such as oil, gas, coal, geothermal, tar sands, oil shale, potassium, phosphate, sodium, asphaltic materials.

LEASE.

1. A legal document that conveys to an operator the right to drill for oil and gas.

2. The tract of land, on which a lease has been obtained, where producing wells and production equipment are located.

LEASE NOTICE. Provides more detailed information concerning limitations that already exist in law, lease terms, regulations, or operational orders. A lease notice also addresses special items the lessee should consider when planning operations, but does not impose new or additional restrictions. Lease notices attached to leases should not be confused with NTLs (Notices to Lessees).

LEK. A traditional breeding area for grouse species where territorial males display and establish dominance.

LIGNITE. A brownish-black coal that is intermediate between peat and subbituminous coal.

LITHIC SCATTER. The waste material, chips, and flakes resulting from stone tool manufacture.

LOAMY. Soil that is intermediate in texture and properties between sandy and clayey soils. Textural classes are sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, sandy clay loam, and clay loam with clay content between 18 and 35 percent.

LOCALITY. The area where paleontologic material is discovered.

LOCATABLE MINERALS. Minerals or materials subject to disposal and development through the Mining Law of 1872 (as amended). Generally includes metallic minerals such as gold and silver and other materials not subject to lease or sale.

MESIC AREA. A habitat having a moderate amount of moisture available for the support of plant life.

MINERAL MATERIALS. Widespread deposits of common clay, sand, gravel, or stone that are not subject to disposal under the 1872 Mining Law, as amended.

MITIGATION MEASURES. Methods or procedures developed for the purpose of reducing or lessening the impacts of an action.

MONITORING. Specific studies that evaluate the effectiveness of actions taken toward achieving management objectives.

NATIONAL AMBIENT AIR QUALITY STANDARDS OR NAAQS. The allowable concentrations of air pollutants in the air specified by the federal government. The air quality standards are divided into primary standards (based on air quality criteria and allowing an adequate margin of safety requisite to protect the public health) and secondary standards (based on air quality criteria and allowing an adequate margin of safety to protect the public welfare from any unknown or expected adverse effects of air pollutants).

NO SURFACE OCCUPANCY. Use or occupancy of the land surface for fluid mineral exploration or development is prohibited to protect identified resource values.

NORTHERN CHEYENNE RESERVATION. The Northern Cheyenne Reservation as established by Executive Orders of November 26, 1884 and March 19, 1900.

NOTICE TO LESSEES (NTL). The NTL is a written notice issued by the Authorized Officer. NTLs implement regulations and operating orders, and serve as instructions on specific item(s) of importance within a State, District, or Area.

PARENT MATERIAL. The unconsolidated and chemically-weathered mineral or organic matter from which the horizons of soils develop by natural processes.

PARTICULATE MATTER. A particle of soil or liquid matter (e.g., soot, dust, aerosols, fumes and mist).

PERENNIAL STREAM. A permanent stream that flows 9 months or more out of the year.

PERMEABILITY. The ease with which gases, liquids or plant roots pass through a layer of soil. Accepted as a measure of this property is the rate at which soil transmits water while saturated, and may imply how well water passes through the least permeable soil layer.

pH. A measure of acidity or alkalinity. A solution with a pH of 7 is neutral, pH greater than 7 (to 14) is alkaline, and a pH less than 7 (to 0) is acidic.

PLANNING AREA. For this supplemental environmental impact statement, the planning area is the Billings and Powder River RMP areas. This is the 13-county area within which the BLM has CBNG development interest.

POST-FLPMA LEASES. Oil and gas leases issued after the passage of the Federal Land Policy and Management Act of 1976. Where occurring in Wilderness Study Areas, these leases have no valid existing rights and could not impair wilderness values.

POTENTIAL NATURAL COMMUNITY. The biotic community that would become established if all successional sequences were completed without interferences under the present environmental conditions.

PARTS PER MILLION (PPM). A measurement to identify the amount of particulates in air or water.

POD. Describes the general location of a series of wells that tap individual coal seams within a single 80-acre spacing unit. For example, within the Powder River Basin, three coal seams are layered beneath the surface. On the surface, an operator may drill three separate wells to different depths to tap these individual seams. The wells may be located within 20 feet of each other, representing a pod of wells.

PRAIRIE DOG COLONY COMPLEX. A group of prairie dog colonies distributed so that individual black-footed ferrets can migrate among them commonly and frequently. This distance has been determined to be 7 kilometers (4.4 miles).

PRE-FLPMA LEASES. Oil and gas leases issued prior to the passage of the Federal Land Policy and Management Act of 1976. Where occurring in Wilderness Study Areas, these leases have valid existing rights which allow development even if wilderness values may be impaired.

PREVENTION OF SIGNIFICANT DETERIORATION OR PSD. A regulatory program under the Clean Air Act (Public Law 84-159, as amended) to limit air quality degradation in areas currently achieving the National Ambient Air Quality Standards. The PSD program established air quality classes in which differing amounts of additional air pollution is allowed above a legally defined baseline level. Almost any additional air pollution would be considered significant in PSD Class I areas (certain large national parks and wilderness areas in existence on August 7, 1977, and specific Tribal lands redesignated since then). PSD Class II areas allow that deterioration associated with moderate, well-controlled growth (most of the country).

> **Class I.** An area that allows only minimal degradation above "baseline." The Clean Air Act designated existing national parks over 6,000 acres and national wilderness areas over 5,000 acres in existence on August 7, 1977, as mandatory Federal Class I Areas. These areas also have special visibility protection. In addition, four tribal governments have redesignated their lands as Class I Areas.
>
> **Class II.** An area that allows moderate degradation above "baseline." Most of the United States (outside nonattainment areas) is Class II.
>
> **Class III.** Any area that allows the maximum amount of degradation above "baseline." Although the U.S. Congress allows air quality regulatory agencies to redesignate Class II lands to Class III, none have been designated.

PRODUCED WATER. Water produced from oil and gas wells.

RAPTOR. Bird of prey with sharp talons and strongly curved beaks (hawks, falcons, owls, and eagles).

RECLAMATION. Rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation, and other work necessary to restore it for use.

RESERVE PIT.

1. Usually an excavated pit that may be lined with plastic, that holds drill cuttings and waste mud.

2. Term for the pit that holds the drilling mud.

RIGHT-OF-WAY GRANT. A document authorizing a nonpossessory, nonexclusive right to use federal lands for the limited purpose of construction, operation, maintenance, and termination of a pipeline, road, or powerline.

RILL. Small, conspicuous water channel or rivulet that concentrates runoff; usually less than 6 inches deep.

RIPARIAN/WETLAND AREA. An area of land directly influenced by permanent water. It has visible vegetation or physical characteristics reflective of permanent water influence. Lakeshores, streams and permanent springs are typical riparian areas.

Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.

ROAD. A vehicle route that has either been improved and maintained by mechanical means to ensure relatively regular and continuous use, or been established where vehicle travel has created two parallel tracks lacking vegetation.

SALINITY. A measure of the salts dissolved in water. See **alkalinity**.

SEDIMENT. Soil, rock particles and organic or other debris carried from one place to another by wind, water, gravity, ice, or other geologic agent.

SEDIMENTARY ROCK. A layered rock resulting from the consolidation of sediment, such as shale, sandstone, and limestone.

SEISMIC OPERATIONS. Use of explosive or mechanical thumpers to generate shock waves that can be read by special equipment to give clues to subsurface conditions.

SENSITIVE SPECIES. Species designated by a State Director, usually in cooperation with the State agency responsible for managing the species and State Natural heritage programs, as sensitive. They are those species that: (1) could become endangered in or extirpated from a state, or within a significant portion of its distribution; (2) are under status review by the FWS and or NOAA Fisheries; (3) are undergoing significant current or predicted downward trends in habitat capability that would reduce a species'' existing distribution; (4) are undergoing significant current or predicted downward trends in population or density such that federal listed, proposed, candidate, or State listed status may become necessary; (5) typically have small and widely dispersed populations; (6) inhabit ecological refugia or other specialized or unique habitats; or (7) are State listed but which may be better conserved through application of BLM sensitive species status.

SERAL COMMUNITY. One of a series of plant communities that follow one another in time on any given area.

SERAL STAGE. A potential plant community made up of a mix of trees and shrubs.

SHALLOW COAL SEAM. Those coal seams that are too shallow to drill to directionally given the area geology and spacing limitations.

SHEET EROSION. The detachment of soil material from the land surface by raindrop impact and its subsequent removal by runoff.

SHUT IN. To close the valves on a well so it ceases production.

SHRUB. A low, woody plant, usually with several stems; may provide food and/or cover for wildlife.

SODIUM ABSORPTION RATIO. An expression of relative activity of sodium ions in exchange reactions with soil, indicating the sodium or alkali hazard to soil. It is a particularly important measure in waters used for irrigation purposes.

SODIUM-AFFECTED SOIL. A nontechnical term for sodic soil (also called alkali soil) that contains sufficient sodium to interfere with the growth of most crop plants and in which the exchangeable sodium percentage is 15 or higher. It is also a generic way of describing nonsaline-alkali soil or saline-alkali soil.

SOIL DEPTH CLASSES. Classes overlap from 0 to 60 or more inches with specific depths as follows: very shallow 0-10 inches, shallow from 5-30 inches, moderately deep from 20-50 inches, deep from 30-60 inches, and very deep from 50 to more than 60 inches.

SOIL SERIES. The lowest category of soil classification, being a subdivision of a family and consisting of soils which are essentially alike in all major profile characteristics except in the texture of the "A" horizon (or surface layer).

SOIL SURVEY. The systematic examination, description, classification, and mapping of soils in an area, usually a county. Soil surveys are classified according to the level of detail of field examination. Order I is the most detailed, then Order II, on to Order V which is the least detailed. Most BLM soil surveys are Order II or III.

SOLID WASTE. Any solid, semi-solid, liquid, or contained gaseous material that is intended for disposal.

SOUR WELL. A condition caused by the presence of hydrogen sulfide in an oil or gas well.

SPACING UNIT. The number of acres that one oil or gas well will efficiently drain. The Montana Oil and Gas Commission establishes the size of spacing units for each oil and gas field.

SPECIAL STATUS SPECIES. Includes the following; (1) species that have been officially proposed for listing as threatened or endangered by the Secretary of the Interior, (2) species officially listed as threatened or endangered by the Secretary of the Interior under the provisions of the ESA, (3) species designated as candidates for listing as threatened or endangered by the FWS or NOAA Fisheries, (4) species listed by a State in a category implying but not limited to potential endangerment or extinction, (5) sensitive species as designated by a state director.

SPECIES OF SPECIAL INTEREST OR CONCERN. Plant or animal species not yet listed as endangered or threatened but that are undergoing status review by a federal or state agency. This may include plant or animal species whose populations could become extinct by any major habitat change. A species that is particularly sensitive to some external disturbance factors.

SPLIT ESTATE. Surface and minerals of a given area in different ownerships. Frequently, the surface is privately-owned while the minerals are federally-owned.

SPUDDING. To begin drilling; to start the hole.

STEEP SLOPE. Slope greater than 30 percent.

STEP OUT WELL. A well drilled some distance from a proven well to determine the limits of the oil or gas reservoir.

STIPULATION. A condition or requirement attached to a lease or contract, usually dealing with protection of the environment, or recovery of a mineral.

STRUCTURAL IMPROVEMENTS. Improvements such as fences, reservoirs, springs, pipelines, waterspreaders, wells, water troughs, land treatments and instream structures. These improvements are for the livestock grazing, wildlife, recreation, watershed and soils programs.

STRUTTING GROUND. An area used in the spring by sage grouse for courtship displays and breeding. Synonymous with the term "lek."

SUBBITUMINOUS. A black coal, intermediate in rank between lignite and bituminous coal. Distinguished from lignite by higher carbon and lower moisture content.

SULFUR DIOXIDE OR SO_2. A colorless gas formed when sulfur oxidizes, often as a result of burning trace amounts of sulfur in fossil fuels.

SWEET WELL. An oil or gas well lacking any significant amounts of hydrogen sulfide.

SYNCLINES. A downward, trough-shaped configuration of folded, stratified rocks.

TERRACE DEPOSITS. A terrace is one of a series of level surfaces in a stream valley, flanking and more or less parallel to the stream channel. It is above the level of the stream, and represents the dissected remnants of an abandoned flood plain, stream bed, or valley floor produced during a former stage of erosion or deposition.

TOTAL DISSOLVED SOLIDS (TDS). The dry weight of dissolved material, organic and inorganic, contained in water.

TMDL (Total Maximum Daily Load). A TMDL is the total amount of a pollutant that a water body may receive from all sources without exceeding water quality standards. A TMDL can also be defined as a reduction in pollutant loading that results in meeting water quality standards. The TMDL process was established under Section 303(d) of the Clean Water Act. A TMDL includes both a waste load allocation, which focuses on point sources, and a load allocation, which addresses non-point sources.

TRANSMISSION LINE. A large diameter pipeline through which oil or gas moves off lease after being sold.

TURBIDITY. An interference to the passage of light through water due to insoluble particles of soil, organic material, micro-organisms, and other materials.

UNDERGROUND INJECTION CONTROL PROGRAM. A program administered by the Environmental Protection Agency, primacy State, or Indian Tribe under the Safe Drinking Act to ensure that subsurface waste injection does not endanger underground sources of drinking water.

UNDERSTORY VEGETATION. Plants, usually grasses, forbs, and low shrubs, growing beneath the canopy of other plants.

UNITIZATION. Pooling of mineral acreages proposed by a company to facilitate the efficient development of a reservoir based on geology and reservoir characteristics of a producing formation or formations.

UNNECESSARY OR UNDUE DEGRADATION. Conditions, activities, or practices that:

(1) Fail to comply with one or more of the following: The performance standards in Sec. 3809.420 (43 CFR), the terms and conditions of an approved plan of operations, operations described in a complete notice, and other Federal and State laws related to environmental protection and protection of cultural resources;

(2) Are not "reasonably incident" to prospecting, mining, or processing operations as defined in Sec. 3715.0-5 of this title;

(3) Fail to attain a stated level of protection or reclamation required by specific laws in areas such as the California Desert Conservation Area, Wild and Scenic Rivers, BLM-administered portions of the National Wilderness System, and BLM-administered National Monuments and National Conservation Areas; or

(4) Occur on mining claims or millsites located after October 21, 1976 (or on unclaimed lands) and result in substantial irreparable harm to significant scientific, cultural, or environmental resource values of the public lands that cannot be effectively mitigated.

USABLE WATER. Those waters containing up to 10,000 parts per million of total dissolved solids.

VIEWSHED. Landscape that can be directly seen under favorable atmospheric conditions, from a viewpoint or along a transportation corridor.

WATER QUALITY. The chemical, physical, and biological characteristics of water with respect to its suitability for a particular use.

WATERSHED. All lands which are enclosed by a continuous hydrologic drainage divide and lie upslope from a specified point on a stream.

WELL COMPLETION. See **completion**.

WELL LIFE. For the purposes of this plan the well life is defined as from the time the well is drilled until the final abandonment of the well is approved.

WETLANDS. Permanently wet or intermittently flooded areas where the water table (fresh, saline, or brackish) is at, near, or above the soil surface for extended intervals; where hydric wet soil conditions are normally exhibited, and where water depths generally do not exceed two meters.

WILDCAT. A well drilled in an area where no oil or gas production exists.

WILDCAT WELL. An exploratory well drilled in an area where there is no oil or gas production (see exploration well).

WILDERNESS STUDY AREA (WSA). An area deter-mined to have wilderness characteristics. WSAs are submitted to the President and Congress for wilderness designation. These areas are an interim designation, valid until either designated as wilderness or released to multiple-use management.

WORKOVER. To perform one or more remedial operation on a producing well to increase production. Deepening, plugging back, pulling, and resetting the liner are examples of workover operations.

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